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Steamboat Springs Regional Service Authority. 201 Wastewater Facilities Plan

Environmental Protection Agency, Denver, CO

Prepared For
Weiner and Associates, Denver, Colorado

7 Jun 76

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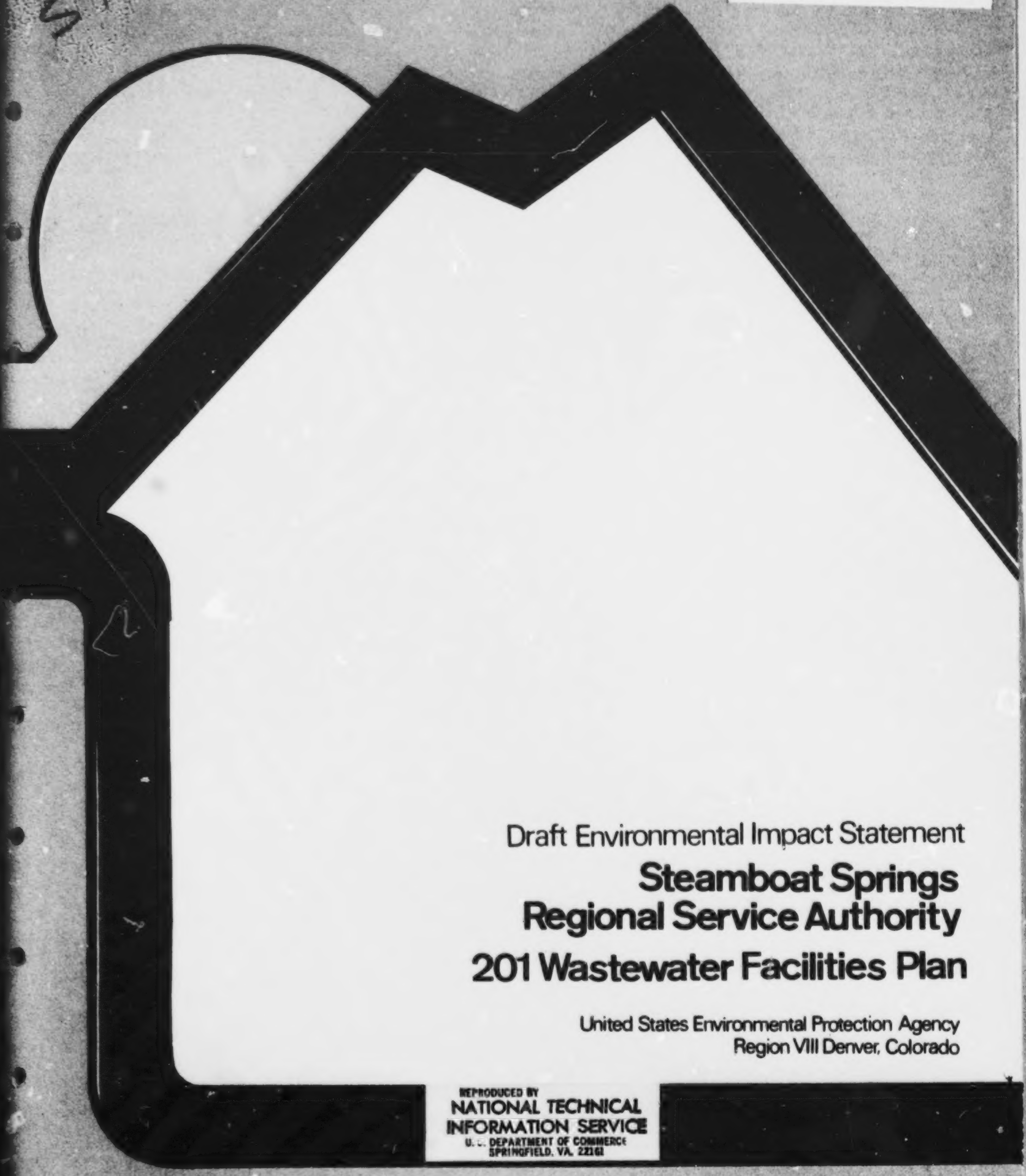

Draft Environmental Impact Statement

Steamboat Springs Regional Service Authority

201 Wastewater Facilities Plan

United States Environmental Protection Agency
Region VIII Denver, Colorado

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The Region 8 Administrator of the U.S. Environmental Protection Agency intends to provide federal matching funds for regional wastewater treatment in the Steamboat Springs region through the authority of the Federal Water Pollution Control Act (as amended, 1972). The purpose of this draft Environmental Impact Statement (EIS), required of federal agencies by the National Environmental Policy Act (NEPA, 1969), is to notify governmental agencies and the public at large of this impending project with potential environmental ramifications.

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Draft Environmental Impact Statement

Steamboat Springs Regional Service Authority

201 Wastewater Facililies Plan

United States Environmental Protection Agency
Region VIII, Denver, Colorado

John A. Gree
Regional Admini

June 7, 1976
Date

Prepared By:
Weiner & Associates, Denver, Colorado

SUMMARY SHEET
Environmental Impact Statement

(x) DRAFT

( ) FINAL

Prepared for the U.S. Environmental Protection Agency, Rocky Mountain - Prairie Region, Region VIII, Denver, Colorado, through a contract with Weiner & Associates, Inc., Denver, Colorado.

A. Type of Action: Administrative (X) Legislative ( )

B. Brief Description of Proposal

The Region VIII Administrator of the U.S. Environmental Protection Agency intends to provide federal matching funds for regional wastewater treatment in the Steamboat Springs region through the authority of the Water Pollution Control Act (as amended, 1972). The purpose of this draft Environmental Impact Statement (EIS), required of federal agencies by the National Environmental Policy Act (NEPA, 1969) is to notify governmental agencies and the public at large of this impending project with potential environmental ramifications.

The principal river drainage is the Yampa River which is in poor condition. This is due to upstream bank erosion, nonpoint runoff, and sewage effluent. This project is intended to consolidate the five existing point sources of sewage effluent into one plant designed to achieve stated water quality goals.

C. Alternatives Considered

The final treatment alternatives combine the existing point sources and can be divided into four action and one no-action options. The action alternatives involve two site and two tertiary, or advanced, treatment choices. Plant site options include use of the existing city lagoon site or a new location three miles west of the city lagoons. Tertiary treatment is necessary to control suspended solids as well as ammonia and chlorine residual. Two alternatives exist for this purpose; one involves use of inplant processes (advanced biological and dual media filtration); while the other applies disinfected secondary effluent to a designated site during summer months when ammonia levels becomes toxic to aquatic life. The latter approach uses the land as a natural filter in a controlled program to achieve tertiary treatment.

A third site, ten miles downvalley, was considered in conjunction with year-round land treatment. This alternative was rejected midway through the planning process because it was feared that it would encourage growth inconsistent with citizen desires and the draft County Comprehensive Plan. In addition, this approach eliminates the growth constraints of the waste load allocations of the discharge permits.

D. Environmental Impacts

A summertime only land treatment program (Alternatives II and IV), with direct discharge during other seasons of the year, allows the productive use of nutrient laden water which increases crop yield; does not require large storage reservoirs (a citizen objection); and retains the growth management aspects of the discharge permits. Therefore, this approach is preferable as it also achieves stated water quality goals.

The new plant site (Midway) offers gravity flow from almost all developed areas and offers a land buffer from existing or planned structures. It is consistent with planning goals and sound land use criteria. The present lagoon site is less desirable because it is near existing residences, in an area slated for more development and is in the 100 year floodplain. In addition, this site would require extensive pumping from downvalley areas. It was determined that the Midway site in conjunction with summertime land treatment would help assure the continued use of land for agricultural purposes and enhance its productivity, a stated citizen goal. Finally, the Midway site with land treatment (Alternative IV) is also found to be the most cost-effective choice.

During the first week of April, 1976, EPA, Steamboat Springs city staff and consultants met with district representatives and the Citizens Advisory Committee (CAC), and unanimously selected Alternative IV -- Midway plant with summertime land treatment.

Unresolved issues for which remedial measures will be developed prior to issuance of the final EIS include:

-- Consolidation plan for the entities that make up the Steamboat Springs Regional Services Authority (SSRSA).

-- Designation of specific Midway plant and land treatment sites and sludge disposal techniques.

-- Delineation of non-structural techniques to control non point sources of discharge.

E. Distribution

The draft EIS is being provided to the following:

Local agencies:

- Routt County Regional Planning Commission
- Routt County Board of Commissioners
- Routt County Environmental Health Department
- Steamboat Springs Planning Commission
- Northwest Colorado Council of Governments
- Member Entities: Steamboat Springs Regional Services Authority
  - City of Steamboat Springs
  - Mt. Werner Water and Sanitation District
  - Riverside Water and Sanitation District
  - West Steamboat Water and Sanitation District
  - Fish Creek Water and Sanitation District
  - Tree Haus Water and Sanitation District
  - Steamboat II Water and Sanitation District
  - KOA Campground Development
  - Sleepy Bear Development

Citizen Advisory Committee Members

Steamboat Springs Public Works Committee

State agencies:

- State Clearinghouse/Division of Planning
  - Colorado Water Pollution Control Division
  - Colorado Air Pollution Control Division
  - Colorado State Board of Land Commissioners
  - Colorado State Land Use Commission
  - Colorado Division of Highways
  - Colorado Division of Wildlife
  - Colorado Department of Natural Resources/Water Resources Division
  - Colorado Historical Society
  - Public Utilities Commission

Federal agencies:

- Forest Service (Routt National Forest & Regional)
- Federal Highway Administration
- U.S. Bureau of Reclamation
- Bureau of Outdoor Recreation
- U.S. Fish and Wildlife Service
- Bureau of Land Management
- Field representative, Office of the Secretary of Interior
- Soil Conservation Service (local and regional offices)
- U.S. Geological Survey
- Economic Development Administration
- U.S. Senators Hart and Haskell
- U.S. Representatives Armstrong, Evans, Johnson, Schroeder, Wirth
- Federal Energy Office
- U.S. Public Health Service
- U.S. Department of Housing and Urban Development

Others:

- Colorado Open Space Council, Inc.
- Trout Unlimited
- National Wildlife Federation
- Rocky Mountain Center on Environment
- Wright-McLaughlin Engineers
- Denver Post
- Rocky Mountain News
- Steamboat Pilot
- Charles Gathers and Associates
- Special Districts Association of Colorado
- Steamboat Ski Area
- Colorado Ute Electric Association
- Colorado Municipal League

G. Acknowledgements:

Many people were helpful in the preparation of this EIS, and it is not possible in a limited space to acknowledge all of them. We would like to give special thanks to the administrative staff of the City of Steamboat Springs, the staff of the Routt County Planning Commission, Charles Gathers and Associates, Wright-McLaughlin Engineers, and the concerned citizens of Steamboat Springs.

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I. Executive Summary

"All alternatives investigated must enhance the agricultural industry of Routt County and the SSRSA study area to provide a diverse economy for the stability of the region."

--Citizens Advisory Committee, 1975

The Region VIII Administrator of the U.S. Environmental Protection Agency intends to provide federal matching funds for regional wastewater treatment in the Steamboat Springs region through the authority of the Federal Water Pollution Control Act (as amended, 1972). The purpose of this draft Environmental Impact Statement (EIS), required of federal agencies by the National Environmental Policy Act (NEPA, 1969), is to notify governmental agencies and the public at large of this impending project with potential environmental ramifications. Funds for construction of necessary facilities will follow agency approval of required preliminary plans (Step 1) and subsequent detailed engineering (Step 2). This EIS is written on the basis of the Step 1 Facilities Plan which includes: preliminary engineering, sewer inflow and infiltration analysis, cost-effectiveness analysis, and environmental considerations.

The Regional Administrator determined early in the Step 1 planning process that an EIS is necessary for this project. As a result, the required environmental assessment (EA) was waved and the study area districts, including the City of Steamboat Springs (referred to as the Regional Service Authority), were authorized to retain a consultant, with the approval and supervision of EPA, for the preparation of this EIS. This approach has saved considerable time and effort by incorporating the EA into the agency EIS. In addition, this "piggyback" approach utilized the EIS consultant, Weiner & Associates, to provide input throughout development of the Facilities Plan prepared by Wright-McLaughlin Engineers, and in-so-doing eliminated environmentally unacceptable alternatives.

The wastewater facility planning effort discussed in this draft Environmental Impact Statement is, in a sense, a model for joint decision making. Local citizens and public officials, engineering and environmental consultants, and sanitation districts in the study area have all contributed to decisions reported in this document. This consortium helped establish water quality goals, define solution alternatives, and select a recommended action. There are, however, several unresolved issues and details which will be satisfied prior to approval by EPA of the Step 1 plan and issuance of the final EIS.

Background

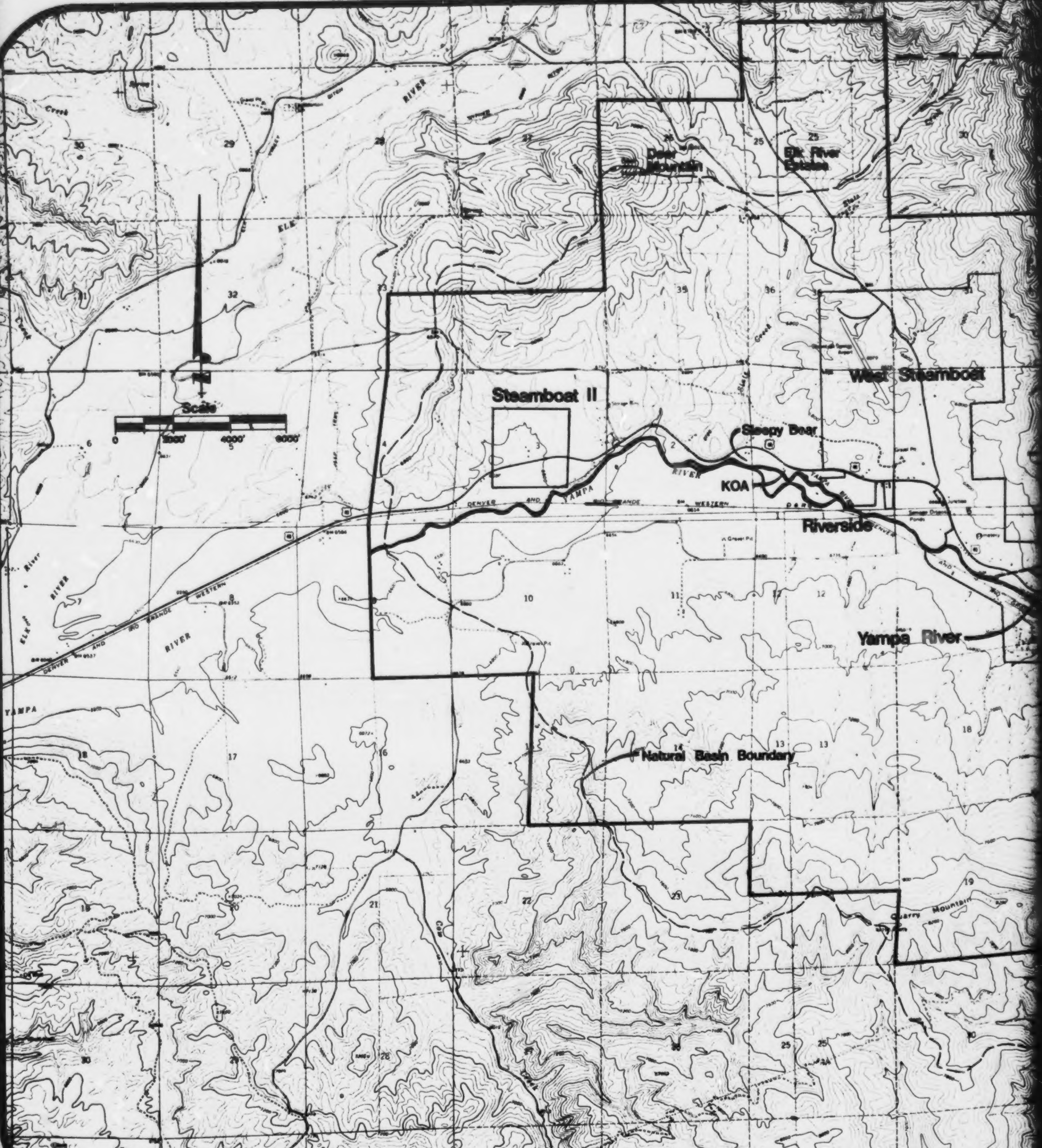
When Congress passed the 1972 Federal Water Pollution Control Act, it provided capital grant monies under section 201 to aid municipalities in complying with the requirements of the Act. The Colorado Water Quality Control Commission included Steamboat Springs in its established priority list for municipalities, designated as eligible to receive these grants on a 75 percent matching funds basis. Under this provision EPA will pay for 75 percent of the capital costs for treatment facilities and their installation. This funding requires the Steamboat Springs Regional Service Authority (SSRSA) to provide 25 percent of total capital costs and all annual operating and maintenance costs. This local share will be borne by the City of Steamboat Springs, six established water and sanitation districts and two private residential developments.

Study Area

Figure 1 displays the official study area designated by the Water Quality Control Division, Colorado Department of Health. This area of investigation lies just west of the Continental Divide in Northwest Colorado. Steamboat Springs is situated at the foot of the 10,000 to 12,000 foot mountains of the Park Range. These mountains within Routt National Forest form the western boundry of the study area with the remaining topography varying from the floodplain of the Yampa River, which bisects the area, to flat mesas and irregular plateaus. Elevations range from over 8,000 feet on the east to 6,500 feet at the west edge of the area.

The major river draining of the study area is the Yampa River. It rises from the mountains southeast of this area, flows through Steamboat Springs, and on to the west where it eventually joins the Green River at Dinosaur National Monument, near the Colorado-Utah border, which in turn joins the Colorado River in Utah. On its course through the study area, the Yampa is joined by several smaller tributary creeks including: Walton, Burgess, Fish, Spring, Butcherknife, Soda, and Slate.

Neighboring Routt National Forest has made Steamboat Springs a resort community offering renowned summer and winter recreation. In addition, the area serves as an agricultural center and is near coal reserves to the east and south. The Bureau of Land Management is currently preparing a draft EIS for development of these coal resources. Land use is divided among resort facilities and accomodations; cropland and rangeland; and residential, commercial, and light industrial areas as shown in Study Map 2.


Deer Mountain
Elk River Estates
Steamboat II
Scale
0
2000'
4000'
6000'
West Steamboat
Sleepy Bear
KOA
Riverside
Yampa River
Natural Basin Boundary
Quarry Mountain

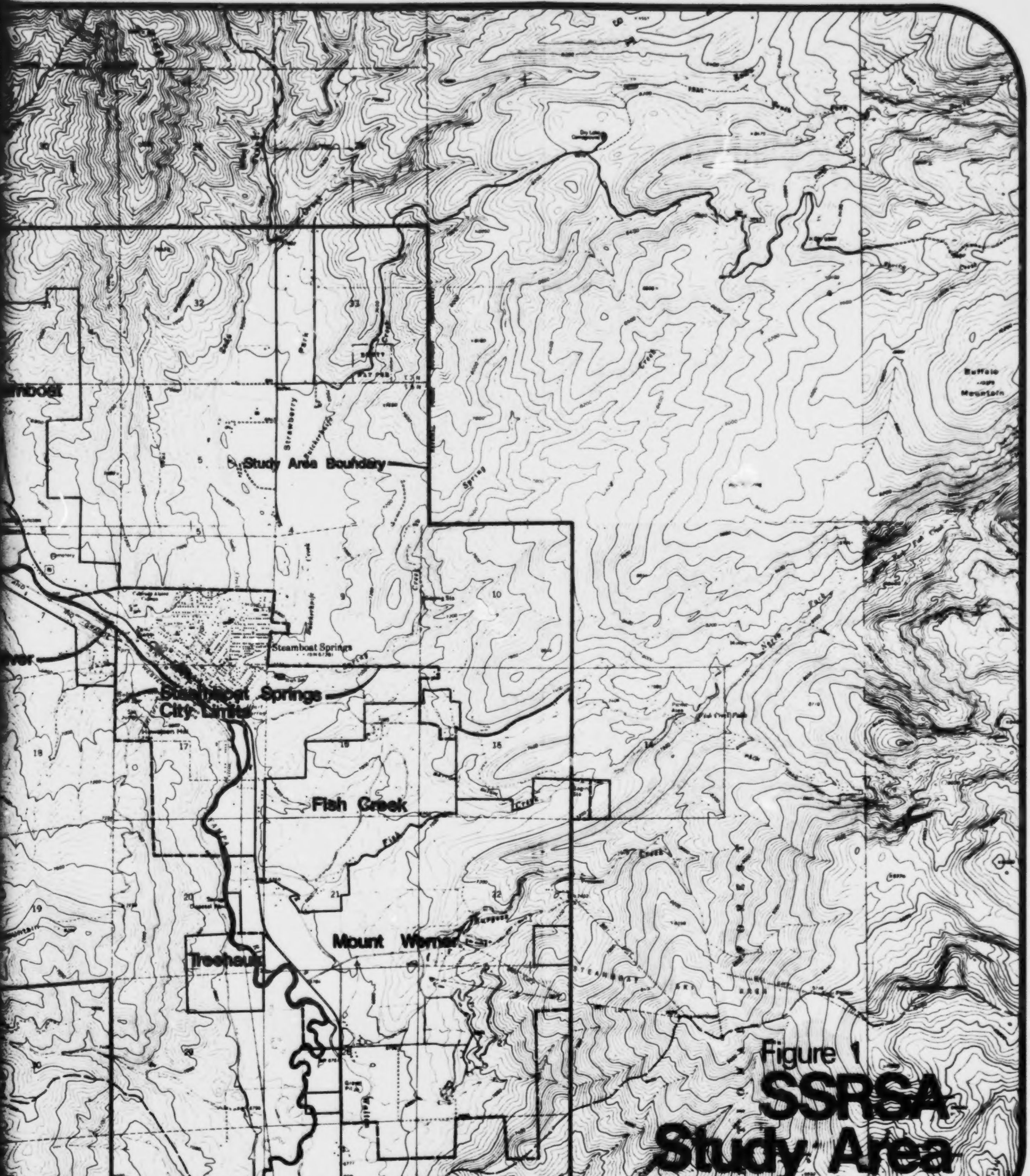

amboat
Study Area Boundary
Buffalo Mountain
ver
Steamboat Springs
Steamboat Springs City Limits
Fish Creek
Mount Werner
Treehaus

Figure 1
SSRSA
Study Area

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Area Water Quality

The general water quality of the Yampa River can be characterized as poor to fair. As a result it is one of the poorest trout streams in the Colorado mountains. One major cause seems to be unstable banks upstream from Steamboat Springs, which erode and cause siltation that covers the bottom for several miles upstream from the city and reduces the river's ability to support aquatic plants and insects. As a result, the natural trout populations suffer, even though they are augmented with stocking by the Colorado Division of Wildlife. Another cause is water runoff from urban areas and poorly drained residential developments.

The total output of pollution from these sources has been estimated by Wright-McLaughlin. Their prediction indicates that by 1985 runoff would annually contribute 3.5 times more suspended solids than the combined effluent output of SSRSA and 55 percent of its BOD_5 or organic matter.

Section 201 of the Act previously cited states that Facilities Plans shall, "... provide control or treatment of all point and nonpoint sources of pollution, ..." However no structural alternatives have been proposed for nonpoint sources because grant funds are limited and Section 208 authorizes specific study of these sources which are yet to be completed. Therefore, it is felt that proposal of structural options would be premature. As a result, the Facilities Plan describes only non-structural (policy) recommendations.

Existing Sewage Discharges

Study Map 1 shows the five point sources currently discharging treated sewage effluent into the Yampa. These sources are summarized as follows:

Source	System Type	Entities Served
Mt. Werner	aerated lagoon	Mt. Werner Water and Sanitation District, Tree Haus District
City of Steamboat Springs	aerated lagoon	City of Steamboat Springs, Fish Creek Water and Sanitation District, West Steamboat Water and Sanitation District, Riverside Water and Sanitation District, and Mt. Werner Bypass
KOA	package plant	KOA Campground--private system
Sleepy Bear	package plant	Sleepy Bear Mobile Home Park--private system
Steamboat II	package plant	Steamboat II Water and Sanitation District

Water Quality Goals

In 1974, the Colorado Department of Health released the "Water Quality Management Plan for the Green River Basin" which assessed the surface waters in the study area and recommended plant discharge limits known as waste load allocations. These recommendations were incorporated into Discharge Permits now administered by the State. Table I compares the 1977 permit requirements and ultimate design criteria prepared by Wright-McLaughlin to present point source discharges. All five sources are in violation of these standards; however, a better record of compliance could be achieved if better management could be exercised over the existing operations. Sewer line inflow and infiltration would also have to be reduced for compliance, at least through July 1, 1977. From this time on, the existing facilities would be mostly inadequate to handle the required treatment.

Compliance with water quality discharge standards will require additional facilities for organic matter (Biological Oxygen Demand--BOD) and suspended solids. EPA has also urged the SSRSA and Wright-McLaughlin to develop design limits for ammonia and chlorine residual. These latter two controls are based on their respective toxicity to fresh water aquatic life as recommended in Quality Criteria for Water (EPA, 1976). Discharge Permits will be updated in the future to include these parameters (See Chapter II).

Treatment capacity will be enlarged in phases consistent with actual population growth and reduction achieved in inflow and infiltration. The population projections developed for this EIS were used by Wright-McLaughlin to estimate construction phases over a 20-year planning period in order to determine necessary plant site areas and to conduct a cost-benefit analysis of these alternatives.

Proposed Alternatives

Chapter V describes the proposed treatment alternatives recommended by Wright-McLaughlin in the Facilities Plan. All treatment alternatives combine the existing point sources into one plant for treatment. These alternatives can be divided into four action and one no-action options. The action alternatives involve two site and two tertiary, or advanced, treatment choices.

An outfall presently links the Mt.Werner and Steamboat Springs plants. However, all alternatives require that an additional line be constructed between the city proper and its lagoons. This would parallel the existing Steamboat Springs outfall thus providing needed additional capacity. The Mt. Werner plant will be used for flow leveling also in conjunction with all proposed alternatives.

Table 1

SSRSA Plant Discharges

	1975 Discharge[1]	1977 Permit Limits[2]	1983 Design Criteria[3]
BOD_5	313 to 664 lb/day	238 lbs/day or 85% removal	238 lbs/day or 10 mg/l
Suspended Solids	11 to 120 mg/l	85% removal	10 mg/l
Fecal Coliform	500 to 280,000 per 100 ml	Variable, to maintain stream concentration below 200/100 ml	200/100 ml
Residual Chlorine	--	Unknown	0.025 mg/l
Ammonia (NH_3-N)	0.08 to 18.0 mg/l	Unknown	Varies Monthly (2 to 9 mg/l)
pH	7.1 to 8.8	6.0 to 9.0	6.5 to 8.5
Flow	1.71 to 2.24 mgd	--	1.62 mgd[4] (1985)

[1] Based on data from Table VII except for suspended solids, which comes from Table IX.

[2] Effective July 1, 1977.

[3] Recommended by Wright-McLaughlin Engineers.

[4] Reflects reduction in Inflow and Infiltration

The proposed alternatives are summarized as follows:

- Alternative I includes all primary, secondary, and tertiary treatment in-plant at the existing Steamboat Springs sewage lagoons. Sewage would have to be pumped from the Steamboat II, Sleepy Bear, KOA, and Riverside residential areas.

- Alternative II employs the same site to treat the wastewater to secondary levels and then applies the disinfected effluent during the summer to land in a controlled program to use the land as a natural filter medium. This process will control ammonia during summer months when levels become toxic to stream aquatic life due to high water temperature and low flow. This process will control suspended solids, thus in-plant dual media filtration would be used only in non-irrigating months.

- Alternative III, like Alternative I, utilizes only in-plant processes at a new plant site proposed on or near property in the western portion of the study area shown in Figure 2. This site is referred to as the Midway Site and would be built in phases in order to utilize the existing facilities and for cost-effective purposes. A new outfall would join the Steamboat Springs lagoons with Midway, ultimately retiring the existing lagoons around 1985. Pumping would be required from Steamboat II only.

- Alternative IV is the summertime land treatment variation of Alternative II with the plant located at Midway according to phased construction similar to Alternative III.

- Finally, there is the no-action alternative which would leave the five point sources as is, thus not providing for future growth and allow continued violation of water quality standards.

Until recently, the locations under consideration also included a western site just east of the confluence of the Elk and Yampa Rivers. This site offered gravity flow from all portions of the study area except those subdivisions north of the airport which would have to be pumped for all alternatives. It also offered compatability with a land treatment program for accumulated secondary effluent from year-round flow (classical land treatment). This concept would require winter effluent storage in constructed reservoirs and land application during summer months. The western site was subsequently rejected because it was feared that it would readily facilitate growth inconsistent with citizen desires and the unadopted Comprehensive Plan. In addition, a year-round flow, land treatment program eliminates the constraints of the Discharge Permits. These permits specify allowable effluent concentrations which can be discharged to a receiving body of water. The specified limits consider the loading

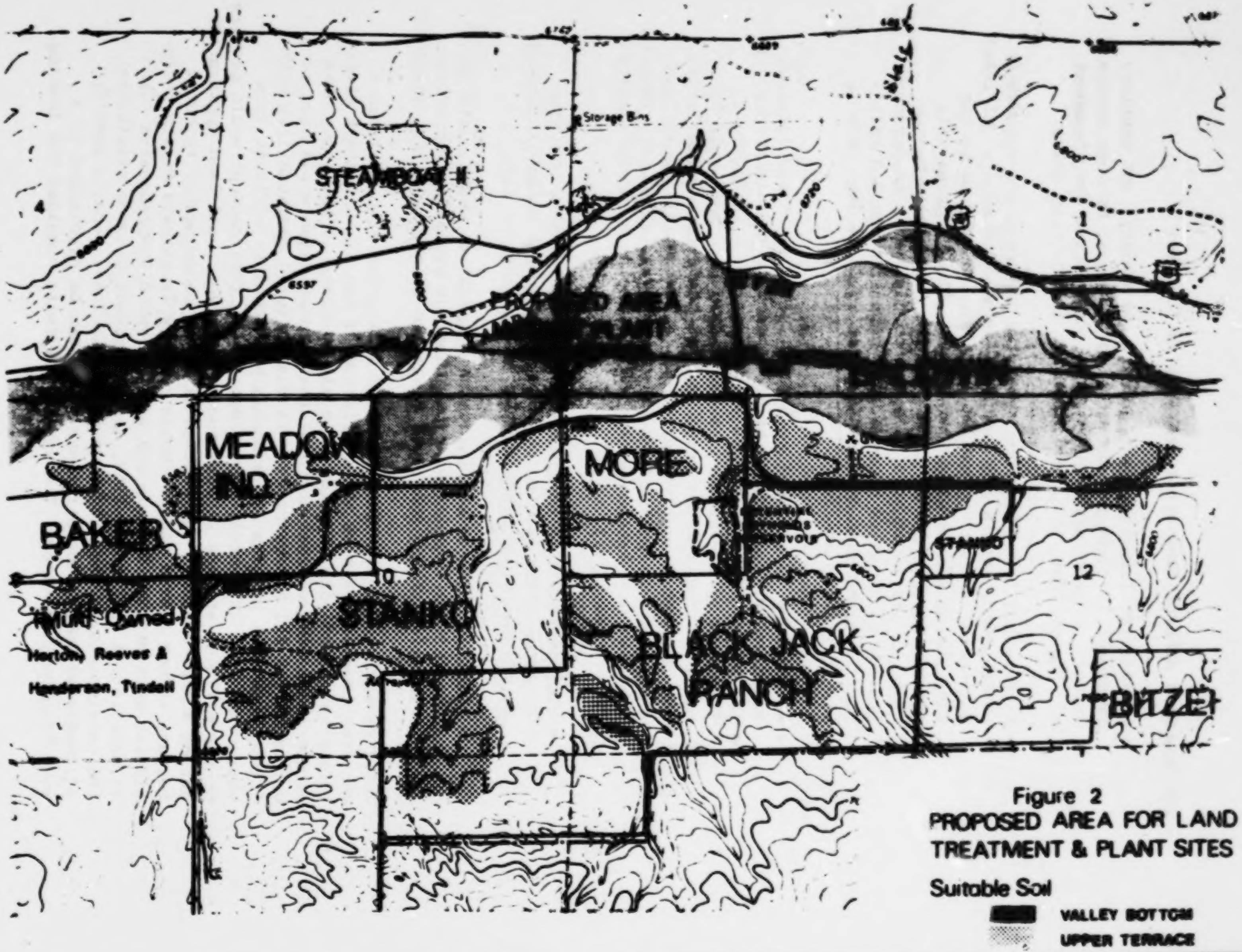
STEAMBOAT II
Storage Bins
PROPOSED AREA
PLANT
MEADOW
IND.
MORE
BAKER
STANKO
BLACK JACK
RANCH
BITZEI
(Multi Owned)
Horton, Reeves &
Henderson, Tindall
4
10
12
1
Suitable Soil
VALLEY BOTTOM
UPPER TERRACE

Figure 2
PROPOSED AREA FOR LAND TREATMENT & PLANT SITES

Area of proposed Midway Plant and land treatment sites
(looking east, ski area in background)

capability of the river in pounds per day (waste load allocation) and, through a given treatment technology, can be translated back to a design flow, hence service area population. In this sense, Steamboat Springs officials and EPA feel that Discharge Permits are tangible growth management tools.

A classical land treatment program, without direct discharge to the river, would open up the area's allocation. Theoretically, a proposed development inconsistant with land use goals, could construct its own sewage system and use the available allocations. The costs of such a system, designed to meet standards, would make such an event unlikely; however, the potential exists.

Evaluation of Proposed Alternatives

Representatives of the EPA, State Health Department, City of Steamboat Springs, Routt County, Wright-McLaughlin, Weiner & Associates, and two citizens committees met often to discuss these alternatives. Opinion varied dramatically, as some favored purely gravity flow systems, while others saw growth management capability in a gravity flow/forced main system. Both extremes have sound reasons for treatment plant location. Opinion also varied on tertiary methods with some questioning the feasibility of land treatment in a sub-alpine climate.

Treatment Options

A summertime only land treatment program, (Alternative II and IV) with direct discharge during other seasons of the year, allows the productive use of nutrient laden water which increases crop yield; does not require large storage reservoirs (another citizen objection); and retains the growth management aspects of the Discharge Permits.* Also, if lowlands near the Yampa River are irrigated, a Discharge Permit may still be needed. Irrigation in this area would require underdrains to collect treated water and discharge it to the Yampa.

Irrigation, in this sense, would be construed as the controlled discharge of effluent by spraying or surface spreading to support plant growth and to treat the wastewater. Thus, instead of removing various constituents like nitrogen and phosphorus, they would be beneficially utilized by the crops. The land application technique uses the land and its associated biosystem as a living filter medium. Treatment is accomplished by a combination of physical, chemical and biological means, as the applied wastewater seeps into the soil. Many of the impurities that are entrapped in the soil are eventually used by the higher plants as a growth component and the wastewater receives the equivalent to tertiary treatment.

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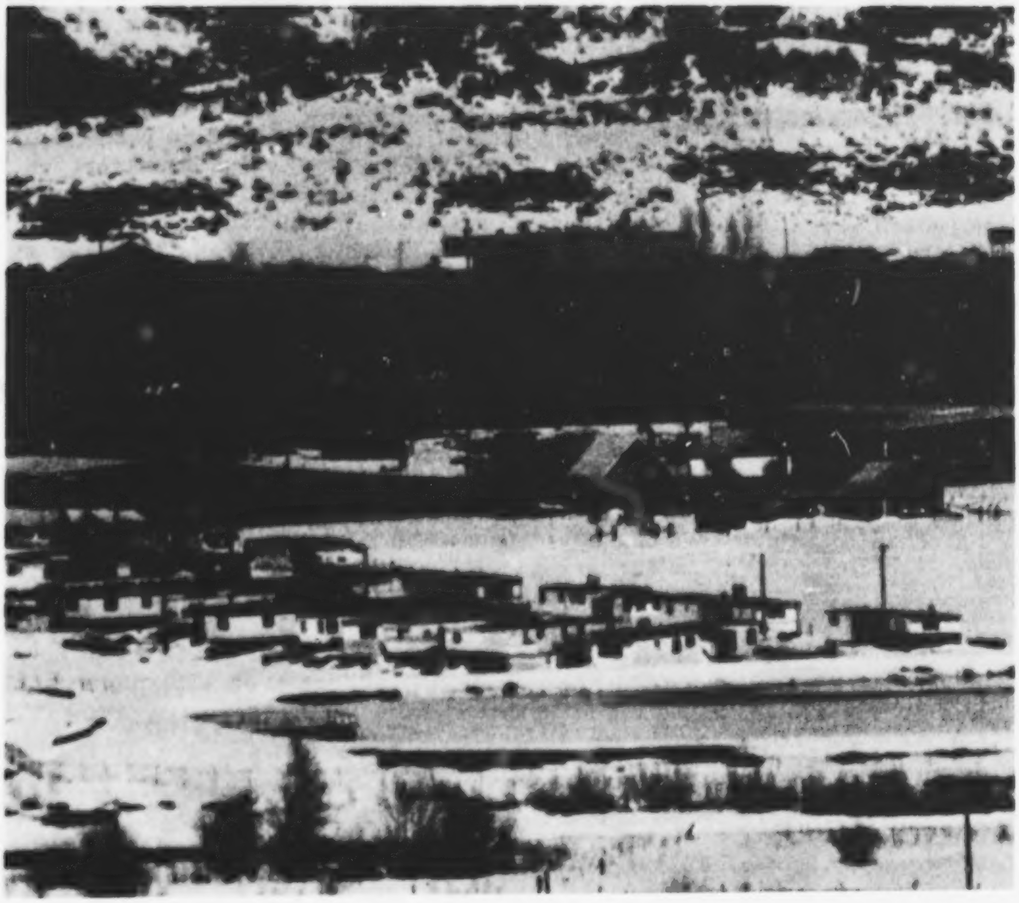
*Permits specify pounds per day with no credit given for summer when there is no direct discharge.

The success of such a program is highly dependent upon effluent application rates, proper management, and appropriate site conditions. Much of the area shown in Figure 2 provides acceptable soil conditions compatible with a proposed application rate of three to seven acre-feet per acre per year. Since the actual site has not been selected, tests will have to be made to determine proper rates for the particular parcel once acquired. If the site (approximately 134 acres) is located in the river bottom land, then underdrains are proposed to compensate for the high water table and a higher hydraulic loading (application rate). With proper testing, this is an environmentally acceptable approach which will enhance drainage even in non-irrigating periods. Whether effluent is applied by spraying, contour overland flow, or a combination of both depends on site location and thus remains an issue to be resolved prior to the final EIS. Likewise, the method of application and rates will vary if the site is choosen from upper terrace land. This area is not currently irrigated but suitable soils exist and proper application to this soil will not only achieve tertiary treatment but also increase crop productivity. Here again, site specific tests must be made for application rates to assure that nitrate buildups are avoided by balancing the nitrogen applied with the capacity of the plants to absorb and the soil to gasify the nitrogen compounds. The growing season in the proposed area is 90 - 100 days which is compatible with a summertime land treatment program. Therefore climate is not an obstacle to this tertiary process. Although in-plant processes are environmentally acceptable, a properly designed and managed summertime land treatment program has numerous advantages; therefore, EPA recommends the approach of Alternatives II and IV for the Steamboat Springs study area.

Plant Site Options

Plant site selection is a major decision affecting land use in the study area. At the existing site, adjacent new plant construction would be in the 100-year floodplain. Besides the flood hazard to new facilities which requires flood proofing, such construction would restrict the flood flow and slightly raise the flood height upstream, potentially effecting nearby structures. The present site is in an area that is already developed to a limited extent and, on 1995 land-use maps, is slated for heavier development. Should the land immediately surrounding the existing site turn out to be densely populated, as planned, problems are likely to develop. The history of sewer plants in populated areas is not very good since people have an almost instinctive reaction against such facilities. Also, there are the practical concerns for noise and odor.

The Midway Site is proposed in an area that the draft Comprehensive Plan and citizens alike agree should remain agricultural. This site would convert a relatively small parcel of agricultural land (approximately 20 acres); however, its close proximity to a summertime land treatment



Trailer court neighboring City lagoons in foreground site makes this a desirable location. In addition, this site will be located outside the 100-year floods plain, unlike the present lagoons, and would only require pumping from the Steaboat II subdivision, if at all, depending on the actual site acquired. Negotiations will have to be conducted with property owners of potential sites in the proposed area (Figure 2) before a specific site can be identified. Therefore the Midway Plant site remains an issue which will be resolved prior to issuance of the final EIS.

In summary, the present lagoons should be used for the short-term to utilize their potential, but a new Midway Site is preferable in the long run, particularly in conjunction with a land treatment program which would help assure the continued use of land for agricultural purposes and enhance its productivity, a stated citizen goal.

Costs

Economic analysis of engineering alternatives is usually done by means of a present worth technique. This approach considers the time effect of money and is very important when phased construction is considered. Wright-McLaughlin used this approach to compare capital costs for treatment plant components and connecting interceptors. The capital investment in present worth terms is compared as follows:

Alternative		Present Worth Values - Capital Costs ($)		
		Federal Share	Local Share	Total
I. Existing Site	Phase 1	2,485,282	828,427	3,313,709
& In-plant Tertiary	Phase 2	←497,883*→		497,883
Total				3,811,592
II. Existing Site	Phase 1	2,423,525	807,841	3,231,366
& Summertime LT	Phase 2	←811,338→		811,338
Total				4,042,704
III. Midway Site	Phase 1	1,974,357	658,119	2,632,476
& In-plant Tertiary	Phase 2	←1,041,435→		1,041,435
Total				3,673,911
IV. Midway Site	Phase 1	1,726,919	575,639	2,302,558
& Summertime LT	Phase 2	←1,350,064→		1,350,064
Total				3,652,622

*201 capital grants are for Phase 1 facilities only. No matching funds program presently exists for Phase 2 construction.

These values point out an interesting issue which results from administration of these 201 grants. Alternative IV has a clear advantage in terms of total capital costs for Phase 1 (1977) and Phase 2 (1985) construction. However, no assurance can be made that federal matching funds will be available in 1985 for construction of Phase 2 facilities. Therefore, what is cost-effective for the project in the long-term and for the Federal Government in Phase 1, turns out to be least cost-effective for study area residents if they have to eventually assume 100 percent of Phase 2 costs in addition to the local share of Phase 1.

Fortunately, the operation and maintenace (O & M) costs of Alternative IV offer an economic advantage over the life of the system. The net result, according to Wright-McLaughlin, is that Alternative IV remains the most cost-effective approach even with local financing of Phase 2. Were this not the case, EPA grant policy pursuant to the Federal Water Pollution Control Act would encourage construction of treatment plants now, which provide for long-term needs thus potentially creating a significant growth stimulant through excess capacity. Therefore, EPA intends to investigate this situation as it may apply to all such 201 projects.

Recommended Action

It is EPA policy that selection of an alternative be made at a local level with active citizen participation, providing that the choice adheres to sound engineering principals and is environmentally acceptable. On April 2, 1976, City staff consultants and EPA officials met with district representatives and the Citizen's Advisory Committee (CAC). Consideration of all engineering options, cost estimates, and environmental factors lead to the recommendation of Alternative IV--Midway Plant with summertime land treatment. The CAC met again on April 8 and voted its concurrence with this choice. EPA agrees with the preference shown in selection of Alternative IV, but additional material and unresolved issues must be satisfied prior to issuance of the final EIS.

Unresolved Issues

This planning effort has come a long way over the last year, yet some details and issues remain unsatisfied. The most significant unresolved issue is the financial condition of most of the entities which make up SSRSA. The member districts have existing bond indebtedness which have repayment schedules that call for increasingly larger payments with time. Known as ballooned payments, this assumes a growth rate which has not occurred so that projected revenues are not being realized. As a result, these districts are in poor financial condition and their ability to raise the 25 percent local share required for this project, is doubtful. Consolidation has been recommended to resolve this situation with the City assuming control of a regional service authority. However, much remains to be done to find an equitable means of consolidating these public and private systems, as well as dividing capital, operations, and maintenance costs of this 201 project in a fair manner. In addition to negotiation and selection of specific sites for the treatment plant and land application program, a compatible sludge disposal system must be chosen. Digested sludge would be applied to the same site as secondary effluent and the means of application, like for effluent, depends on the characteristics of the site selected. EPA recommends that a site be choosen which allows direct spreading during summer months from a specifically designed vehicle. Digested sludge spraying poses public health questions unresolved by research and therefore should be avoided if possible.

The above items remain issues, however EPA will be satisfied that they will be properly resolved prior to issuance of the final EIS for this project.

II. Water Environment

Goals

In this section agency and citizen water quality aspirations are summarized into policies and translated into needed facility additions. The facilities additions are referred to as structural and non-structural alternatives and are developed to implement the policies. The discussion begins with a review of the expressed citizen goals and agency regulations and is followed by a description of the design engineer's recommended design criteria.

The 201 facilities planning for Steamboat Springs is fortunate to have participation from an active and inquisitive citizenry manifested in the Citizen's Advisory Committee (CAC). The goals of this committee were published in the January 23, 1975 Steamboat Pilot and they were unusually succinct and specific (Table II). The Pilot also published a lengthy questionnaire on numerous water-related topics (WME, Volume I, pp. III22-33). Responses to this questionnaire indicated that the problem of Yampa River quality/flow and water/sewer systems was the third most important priority behind the county's problems of managed growth and improvements in the local economy. Additional interest was indicated for the development of an areawide wastewater treatment system, a raw water storage and treatment system, and consolidation of the nine districts that handle the area's sewage effluent.

The members of the CAC served as "watchdogs" during the entire 201 Step 1 process, meeting at least monthly over the last year and a half. The work effort of the project engineer--Wright-McLaughlin, as well as that of the environmental consultant--Weiner & Associates, was continuously reviewed by the CAC for its achievements toward their expressed goals.

The Colorado Department of Health, the US Environmental Protection Agency (EPA), and Routt County are currently the principal regulatory agencies associated with water quality in the Steamboat Springs area. The State of Colorado has exercised its option under the Water Pollution Control Act of 1972 as Amended (PL 29-500), and it has assumed the primary responsibility for administering the National Pollutant Discharge Elimination System (NPDES). This system allows wastewater permits to be issued by the Health Department's Water Quality Control Division and it prescribes allowable discharge levels for wastewater effluents. Another arm of the Health Department, the Water Quality Control Commission, helps administer the available federal funds for planning and constructing wastewater facilities, in conjunction with the EPA. This commission establishes priorities for allocating these funds within the State of Colorado.

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TABLE II

STEAMBOAT SPRINGS REGIONAL SERVICES AUTHORITY

WASTEWATER MANAGEMENT FACILITIES PLANNING STUDY
WATER-ORIENTED GOALS AND POLICIES
BY STEAMBOAT CITIZENS ADVISORY COMMITTEE

Our goal is an enjoyable Yampa river - enjoyable from its headwaters to the county line. We believe that the stream banks and water should be protected from further degradation and that restoration and improvement of the river should be undertaken so that it becomes a flourishing environment for fishing, and swimming, and as a wildlife habitat. A green Yampa Valley will also serve to shape our urban area by helping to control urban sprawl.

1. The Yampa River and its tributaries should be fishable and swimmable, suitable for body contact anywhere in Routt County, and the water should be less polluted when it leaves the study area than when it enters.

2. Wastewater management systems shall be designed to meet the 1985 federal water quality goals "that the discharge of pollutants into navigable water be eliminated by 1985." This goal is interpreted to mean that water discharged to the Yampa be essentially of the same high quality as the natural Yampa River water.

3. One of the alternatives to be investigated should be land treatment. If at all possible, nutrient-laden wastewater should be utilized for agricultural and reclamation purposes rather than being discharged into the stream.

4. An advanced level of waste treatment is necessary to provide a realiable and consistently high quality of effluent discharged to the Yampa River.

5. All alternatives investigated must enhance the agricultural industry of Routt County and the SSRSA study area to provide a diverse economy for the stability of the region.

6. Urban storm runoff and urban snowmelt carry many harmful pollutants to the stream. Alternatives must consider the possible storage and treatment of runoff to achieve the clean water goals articulated by Congress, to mitigate local flooding and to keep wastes out of the stream. Investigate the detrimental effects of the mineral and thermal pollution that the natural springs contribute to the Yampa.

7. The implementation of this study shall not interfere with the established minimum flow in the Yampa River, and if possible the minimum flow should be increased.

8. Flood plain management should include flood plain regulations, acquisition of flood plain lands for recreation, fish and wildlife. The value of structural vs. non-structural management as well as relocation aspects deserve study. In so far as possible, flood plain management should enhance the stream's natural eco-systems.

9. The program should be designed to provide controlled public access to the Yampa. Enhancement of the natural beauty of the River should be encouraged.

10. The type and extent of treatment facilities shall be coordinated with public agency planning efforts and Master Plans; ideally providing green and productive open lands.

11. Existing utilities (water, sewer, roads) in existing developments should be rehabilitated to modern levels to provide a better standard of living and to encourage growth within Steamboat Springs and other existing water and sanitation districts, furthering the theme of Urban Conservation.

12. The means of curtailing winter bleeding and other infiltration problems should be studied to provide the best economic practice in terms of water resources and wastewater treatment.

13. The environmental resource should be protected; resources should be managed in cooperation with all other systems and goals.

14. Agricultural, industrial, and other positive endeavors which broaden the economic base and best compliment our resources should be encouraged.

15. Wastewater plans should be laid to positively aid in water resource management

16. This study shall be cognizant of costs, and the greatest benefit to cost relationship shall be of prime concern.

17. Consolidation and unification of the various water and sanitation districts should be studied in consideration of financial and organizational values.

18. The treatment facilities shall be designed and constructed in phases to accomodate expansion in increments according to population and/or needs.

Source: Wright-McLaughlin Engineers, Oct. 1975

Another function of the Water Quality Control Commission has been to set up water quality standards for the state's streams. This role has resulted in establishing four categories: A_1, A_2, B_1, and B_2 (Table I of Appendix A). Streams with the A ratings are those that exhibit a high quality so they can be used for normal raw water purposes, including primary contact recreation (swimming, skiing, etc.); streams with B classifications are those that have a current and future use for non-contact recreation (primarily fishing, etc.). The numerical designation A_1 or B_1 refers to the designation for a cold water fishery and A_2 or B_2 refers to a warm water fishery. Major streams in the state have been placed into one of these four categories; and each one represents a minimum water quality that must be maintained at all times, except during drought periods when flow drops below the seven-day, 10-year average. In the project area, the Yampa River and all of its tributaries are currently classified as B_1 class streams--which is the cold water fishery designation. A summary of its water quality standards are given in Table I of Appendix A, along with the standards for the other three classes.

An important corollary to maintaining a certain stream classification is the control of its point sources of discharge. The Water Quality Control Commission has also established standards for this and they are displayed in Table II of Appendix A. These standards represent the basis of existing permits and most permits conform to them. Routt County has also adopted similar standards, shown in Table III of Appendix A, and they are more stringent than the existing discharge permits (Table IV of Appendix A). This departure from state standards has not been tested by a legal confrontation, yet it may not occur if the state's 1977 permit more closely reflects the county's standards.

In addition to the state and county discharge standards, the Federal Water Pollution Control Act (as Amended) requires that by July 1, 1977, all sewage treatment plants must provide a minimum of secondary treatment to all wastewater plant effluent. Essentially, "secondary treatment" requires a minimum of 85 per cent removal of the organic constituents (biological oxygen demand -- BOD) and suspended solids. A Best Practical Waste Treatment Technology (BPWTT) must also be applied to these effluents before July 1, 1983. This BPWTT may consist of alternatives employing treatment and discharge to navigable waters, land application techniques, or direct reuse. The form it takes should be the most cost effective alternative that provides the treatment necessary to attain the 1983 water quality goal. This goal provides for the protection and propagation of fish, shellfish, and wildlife and also provides for recreation in and on the water (fishable/swimmable goal).

When streams are assigned a particular water quality classification (A_1 or B_1 etc.,) and are regulated for effluent discharges, they are also classified as either effluent limited or water quality limited.

The effluent limited class are those that meet the present water quality standards and will continue to meet them in the future if adequate "secondary treatment" is provided. The water quality limited class consists of those segments where water quality does not now meet the applicable standards and/or is not expected to do so, even after compliance with the secondary effluent limitations.

Further order is imposed on the streams, by the development of an over-all river basin plan. This plan is required by section 303 (e) of PL-92-500 and is intended to establish goals and priorities for water quality and effluent limitations in a particular basin. For the Steamboat Springs area the applicable plan has been completed and is entitled the "Water Quality Management Plan for the Green River Basin" (McCall-Ellingson & Morrill, Inc., April 1974). Based on computer model simulations conducted under the study, the SSRSA area is assigned maximum BOD allocations. The BOD allocation for the SSRSA area totals 240 lbs. per day, of which 238 pounds are allocated to the districts studied in this report and 2 pounds are allocated to Bear Pole Ranch. The study also designated the Yampa River as water quality limited for ammonia, based on the EPA's toxicity criteria. Consequently, the study recommended nitrification controls for the basin's wastewater treatment plants. This recommendation, in conjunction with the BOD allocations, has been accepted by the Colorado Water Quality Control Commission.

Pursuant to the ammonia recommendation, Wright-McLaughlin Engineers have proposed a variable ammonia allocation for the SSRSA (April 1976). It is based on the toxicity of ammonia to aquatic life, projected 1983 sewage loads and the assimilative capacity of the Yampa during 7-day, 10-year low flows. Calculations with these parameters show that the allowable discharge varies from 2.0 to 9.0 mg/ℓ of ammonia-nitrogen, depending on the month (Table III). These results have lead the design engineer to propose a variable ammonia discharge permit.

Based on this proposal, plus federal, state and county regulations, Wright-McLaughlin Engineers have proposed 1978 and 1983 guidelines for effluent discharges in the study area (Table V of Appendix A). A summary of these recommendations is given in Table II. Although these criteria have not been approved by the Water Quality Control Commission, they do reflect existing recommendations and regulations, and they represent a significant step towards achieving the 1983 goal of fishable/swimmable water. Yet, the ultimate achievement of this goal also depends on the implementation of programs to control urban and agricultural runoff. At the printing of this draft EIS, such programs are not developed; however, the design engineer is also preparing a policy statement on them for inclusion in the final EIS.

TABLE III

1983 EFFLUENT DESIGN CRITERIA

Parameter	Concentration	Rationale
BOD_5	238 pounds/day or 10 mg/l	303 Basin Plan allocation >85% removal from influent
SS	10 mg/l	>85% removal from influent
NH_3 - N	Jan. - 8.1 mg/l July - 2.3 mg/l Aug. - 2.0 mg/l Sept - 2.8 mg/l Oct. - 5.9 mg/l Other months - 9.0 mg/l	303 Basin Plan recommends nitrification; Wright-McLaughlin Engineers recommends these allocations based on EPA's toxicity limits, 1983 projected sewage flows and 7-day, 10-year low flows.
P	5 mg/l	Wright-MdLaughlin's recommendation; with 1983 projected flows and 7-day, 10-year low flows, the resultant river concentration would be less than 1 mg/l, the upper limit for non-polluted streams.
Cl Residuals	0.025 mg/l	Wright-McLaughlin's recommendation, based on EPA's toxicity limits, projected 1983 sewage flows and 7-day, 10-year low flows.
Fecal Coliforms	Variable so river concentration is less than 200/100 ml	EPA standards

Existing Water Quality and Quantity

The waters of the project area can be divided into two main categories: surface waters and groundwaters. Both types are used for domestic and agricultural purposes and must be protected to insure their continued value. The surface waters are direct receivers of the secondary effluent from the existing plants; the groundwaters are indirect receivers. Both waters are in contact with each other although the quantity and quality of surface waters are generally more variable. The text that follows highlights the existing information on these environments.

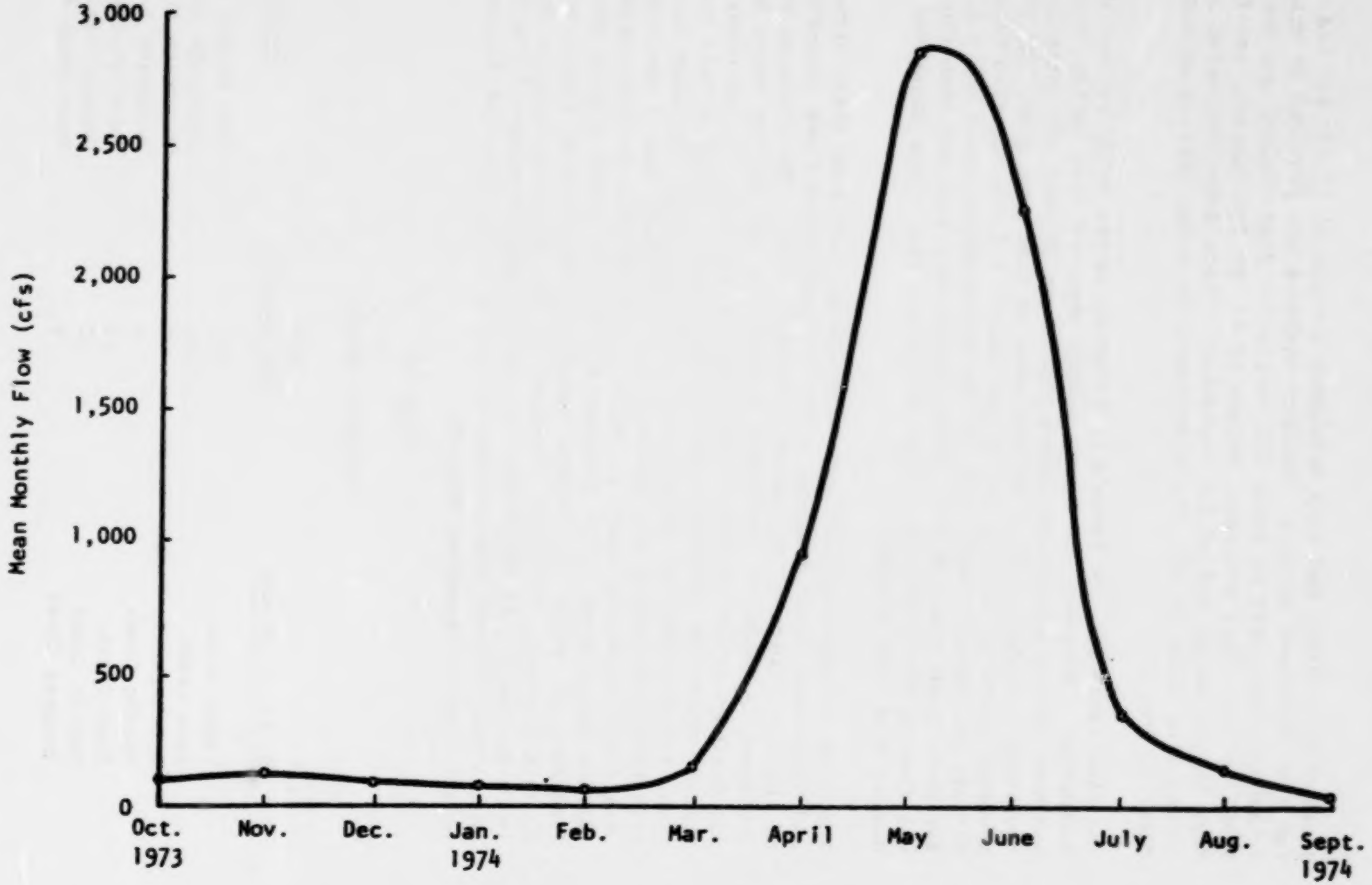
Surface Water

The important surface waters of the project are running waters, represented by the Yampa River and some of its tributaries (Study Map 1). The headwaters of the Yampa River are in Garfield County, about five miles east of Trappers Lake. From here it flows north to Steamboat Springs, then west to Dinosaur National Monument where it joins the Green River. As it flows through the study area, it picks up Walton, Burgess and Fish Creeks from the east and Spring, Butcherknife, Soda and Slate Creeks from the north. None of these creeks are major tributaries, yet they are important to the quality and quantity of the Yampa River in the study area. The text that follows highlights the existing information on these waterways and it is divided into a discussion on water flow and water quality.

Water Flow: Most information on the study area's water flow has been collected on the Yampa River by the United States Geological Survey (USGS). Their permanent gaging station, located at Steamboat Springs, Colorado, has been operative since 1904. The first 67 years of its operation produced an average flow of 469 cubic feet per second (cfs). Its maximum instantaneous flow occurred on June 14, 1921 with a value of 6,820 cfs; the minimum daily flow occurred on September 8, 1934 with a value of 4 cfs. This flow accumulated from a drainage basin of 604 square miles.

Values for the last reported year of operation appear in Figure 3. During this period the maximum instantaneous flow was 5,790 cfs (April 26) and the minimum daily flow was 58 cfs (September 23). Only the minimum flow differed radically from the extreme values of the historical records.

The low flow values for the Yampa are especially important to design engineers since they are interested in the river's ability to dilute sewage effluent. For these purposes, the Colorado Water Quality Control Division recommends a design period that estimates a seven-day average of low flows, occurring once in 10 years. These estimates were made by McCall-Ellingson and Morrill, Inc. in their Green River



Flow Pattern of Yampa River at Steamboat Springs

FIGURE 3

Basin Study (1974), and they developed a value of 27 cfs for the Yampa at Steamboat Springs. Another analysis was provided by Wright-McLaughlin Engineers in their 201 Facilities Plan--Volume One for the SSRSA (1975). They estimated values of 67 cfs for January, 440 for May, 60 for August and 33 for September. Their September value of 33 was very close to the 27 cfs estimated by McCall-Ellingson and Morrill, Inc.

The flow rates for the Yampa's tributaries in the study are not well documented. However, Dr. Robert Pennak observed that Walton, Fish and Soda Creeks contribute substantial flows in July (Wright-McLaughlin Engineers, October 1975). In September of that same year, the USGS recorded flows of 1.2 cfs for Walton Creek, 1.6 cfs for Fish Creek, 0.5 cfs for Spring Creek, 0.8 cfs for Butcherknife Creek and 1.6 cfs for Soda Creek (Table VIII). These values were recorded when the Yampa was flowing about 100 cfs. They also found that Slate Creek was dry during this same period.

The Corps of Engineers did some additional studies on these streams and calculated their drainage areas and peak flood flows (Department of the Army, Corps of Engineers, February 1976). The drainage areas are shown in Table IV, including the overall one for the Yampa River. All drainage areas include regions that drain into a given river or stream, above the location cited in the table. Based on this information, Walton, Fish and Soda Creeks would contribute the most local tributary flow, while the others would contribute lesser amounts. The peak flood flows are shown in Table V, which also includes estimations for the Yampa River. The 100-year flood would occur with an average frequency of one in one hundred years and the 500-year flood, once in five hundred. The area inundated by the 100-year flood is shown in Study Map 1. If the reader desires to know coverage of the 500-year flood, contact the Sacramento Office of the Corps of Engineers or the City of Steamboat Springs.

TABLE IV

DRAINAGE AREAS

River or Stream	Area (sq. miles)	Location
Yampa River	604	USGS gaging station
Soda Creek	20	Corporate limit
Butcherknife Creek	4	Corporate limit
Spring Creek	8	Corporate limit
Fish Creek	25	Upper gaging station
Walton Creek	42	Gaging station
Burgess Creek	4	Near Storm Meadows Dr.

TABLE V

FLOOD FLOWS

River or Stream	Locations	Peak Flow (cfs) 100-yr.	Peak Flow (cfs) 500-yr.
Yampa River	USGS gaging station	8,000	20,000
Soda Creek	Corporate limit	1,300	2,900
Butcherknife Creek	Corporate limit	320	1,300
Spring Creek	Corporate limit	650	2,400
Fish Creek	Upper gaging station	1,800	4,600
Walton Creek	Gaging station	2,700	5,600
Burgess Creek	Near Storm Meadows Dr.	360	1,400

Water Quality: The quality of the Yampa River is well known at Milner and Oak Creek, Colorado. The Milner station is about 11 miles downstream from Steamboat Springs and the Oak Creek station is about 22 miles upstream. The data from these stations has been collected by the Colorado Health Department (Colo. HD) and is displayed in Tables VI and VII. This information is compared with the Colorado standards for B_1 streams. Additional data has recently been collected by the USGS and Routt County as part of a regional study on coal development and a 208 study. Their preliminary data is displayed in Table VIII.

The health department's analysis shows that the Yampa River has historically violated standards for B_1 streams. The Oak Creek station reports violations of dissolved oxygen on two occasions, and the Milner station reports it on four occasions.[1] The Milner station also shows violations in temperature, pH and fecal coliforms. The temperature and pH violations appear to be of natural origin but the violations of fecal coliforms are caused by organic pollution (BOD). The low levels of dissolved oxygen are probably also caused by excessive organic pollution although this has not been determined with certainty.

Other guidelines for stream quality come from the EPA's research report, Water Quality Criteria 1972 and Quality Criteria for Water (1976), which provide recommendations for the maintenance of a healthy aquatic environment. These guidelines indicate that the Yampa has high levels of suspended solids, lead and zinc. The suspended solids decrease between Oak Creek and Milner, and they are highest during runoff periods. The best fish growth occurs when concentrations of suspended solids are less than 25 mg/ℓ; yet the Oak Creek station had values varying between 218 and 518, and the Milner station, between 112 and 334. These values fall within the range of a "fair" fishery, considered to exist between 80 and 400 mg/ℓ.

The total lead concentrations in the Yampa could be especially harmful to tiny aquatic animals like Daphnia (Biesinger, K.E. et al., 1971), who are affected by concentrations over 0.03 mg/ℓ. This concentration was exceeded at the Oak Creek station by 0.09 mg/ℓ on November 25, 1970 and by 0.01 mg/ℓ on May 7, 1975 at the Milner station. These values could also be harmful to trout, however, since preliminary studies have shown detrimental effects at total lead concentrations of 0.10 mg/ℓ (Everhart, 1971; Benoit, 1971).

The zinc levels in the Yampa may be harmful to both aquatic insects and trout. These levels varied from zero to 0.55 mg/ at Oak Creek and from zero to 0.36 at Milner. The maximum values could be excessive because reproduction of Daphnia has been impaired when zinc concentrations reach 0.1 mg/ℓ (Biesinger, K.E. et al., 1971). In addition, the safe levels for rainbow trout could be as low as 0.001 mg/ℓ, much below the maximum values. This later level is developed by multiplying the 96-hour LC50 figure for rainbow trout by 0.01 (EPA, 1976). The LC50 value is the

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[1] These violations occurred prior to 1972; their values are considered questionable by the Colorado Water Quality Control Division.

TABLE [illegible]

WATER QUALITY OF YAMPA RIVER AT MILNER, COLORADO

Sampler: Colorado HD

Sample period: 3/26/68 to 5/7/75

Value	Min.	Max.	Date of Maximum Value	Colorado B_1 Stream Standards
Water Temp. °F	32	72	7/22/69	68
Turbidity JTU	2.7	159.0	4/6/72	No increase >10
Conductivity umhos/cm	54	910	6/15/70	
Dissolved Oxygen mg/l	5.0 (7/22/69)	12.5		>6.0
BOD 5-day mg/l	0.5	4.0	4/16/68	
pH	7.2 (6.7.72)	9.2	7/22/69	6.0-9.0
TDS mg/l	68	398	2/18/69	
Suspended Solids mg/l	112	334	4/22/75	
NH_3-N mg/l	0	0.5	3/4/75	
NO_2-N mg/l	0	0.03	1/24/72	
NO_3-N mg/l	0	1.15	1/14/75	
PO_4 mg/l	0	1.4	6/15/70	
Cyanide mg/l		0		
Total Hardness as $CaCO_3$ mg/l	24	236	2/18/69	
Calcium as $CaCO_3$ mg/l	16	120	4/3/74	
Magnesium mg/l	2	28	2/18/69	
Sodium mg/l	1	45	2/18/69	
Chloride mg/l	0.1	1.3	2/18/69	
Sulfate mg/l	5	128	2/13/[illegible]	
Fluoride mg/l	0.1	4.0	6/5/68	
Arsenic mg/l		0		
Boron mg/l	0	0.12	10/4/71	
Cadmium mg/l		0		
Chromium (+6) mg/l		0		
Copper mg/l		0		
Iron mg/l		1.6	1/11/73	
Lead mg/l	0	0.044	5/7/75	
Manganese mg/l	0	0.1	1/11/73	
Molybdenum mg/l	0	0.04	4/16/74	
Silver mg/l	0	0.019	5/7/75	
Zinc mg/l	0	0.36	4/16/74	
Selenium mg/l	0	0.005	6/5/68	
Total Coliforms per 100 ml	33	23,000	11/26/68	
Fecal Coliforms per 100 ml	2	3300	3/26/68	<1000
Mercury mg/l	0	0.0002	1/24/72	

TABLE VII

WATER QUALITY OF YAMPA RIVER ABOVE OAK CREEK

Sample [illegible]

Sample Period: 11/17/70 to 5/5/75

Value	Min.	Max.	Date of Maximum Value	Colorado B_1 Stream Standards
Water Temp. °F	32	65	7/24/72	68
Turbidity JTU	4	98	12/1/70	No increase >10
Conductivity umhos/cm	75	476	2/3/71	
Dissolved Oxygen mg/1	5.0 (11/1/71)	12.2		>6.0
BOD 5-day mg/1	1.0	9.0	1/15/75	
pH	7.1 (6/7/72)	8.9	8/14/74	6.0-9.0
NH_3-N mg/1	0	0.16	5/7/73	
NO_2-N mg/1	0	0.037	9/25/73	
NO_3-N mg/1	0	1.22	1/15/75	
PO_4 mg/1	0	0.4	2/3/71	
Cyanide mg/1	0	0.6	1/6/72	
Total Hardness as $CaCO_3$ mg/1	86	233	2/3/71	
Calcium as $CaCO_3$ mg/1	59	159	2/3/71	
Magnesium mg/1	6	19	1/11/71	
Sodium mg/1	3	18	2/3/71	
SAR	0.2	0.6	2/3/71	
Chloride mg/1	4	12	11/25/70	
Sulfate mg/1	10	84	4/3/74	

Value	Min.	Max.	Date of Maximum Value	Colorado B_1 Stream Standards
Fluoride mg/1	0.1	0.8	11/25/70	
Arsenic mg/1		0		
Boron mg/1	0	0.12	10/4/71	
Cadmium mg/1		0		
Chromium (+6) mg/1		0		
Copper mg/1	0	0.06	11/25/70	
Iron mg/1	0.02	2.0	5/5/75	
Lead mg/1	0	0.12	11/25/70	
Manganese mg/1		0		
Molybdenum mg/1	0	0.01	5/5/75	
Silver mg/1		0		
Zinc mg/1	0	0.55	5/7/73	
Selenium mg/1	0	0.002	11/12/74	
Total Coliforms per 100 ml	2	30,000	2/3/71	
Fecal Coliforms per 100 ml	1	300	2/3/71	<1000
Mercury mg/1	0	0.0005	11/17/70	0.002
TDS @ 180 °C mg/1	85	341	2/3/71	
Suspended Solids mg/1	218	518	1/15/75	

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toxic concentration that would kill 50 percent of the test organisms within 96 hours. For rainbow trout the 96-hour LC50 value is 0.1 mg/ℓ (Chapman, G.A., unpublished) for chemical conditions similar to those found in the Yampa River.

The phosphate and nitrates in the Yampa River vary considerably between Oak Creek and Milner. Although both of these compounds can cause algal nuisances, the nuisance levels have not been determined for the Yampa River ecosystem. At Oak Creek phosphate-phosphorus ranged between zero and 0.1 mg/ℓ and at Milner, between zero and 0.4 mg/ℓ. The nitrate-nitrogen ranged between zero and 1.22 mg/ℓ at Oak Creek and between zero and 1.15 mg/ℓ at Milner.

The data collected by the USGS and Routt County is displayed in Table VIII: it is preliminary information that is subject to further verification. It includes water quality values for the Yampa River between Agate Creek and the Elk River, plus values for tributaries and effluent discharges. The sample locations are shown on Study Map 1, with the "Y" designations referring to Yampa River sites, the "T" designations to tributaries and the "E" designations to sewage effluents. The range of values for each parameter are reported as minimum and maximum, and they represent the extremes of a 24-hour collection period.

The Yampa River sites showed values that were within the state's standards for B_1 streams, with the exception of site Y8, the most downstream site. It had a pH value of 9.1, which is outside the accepted range of 6.0 - 9.0. The values for phosphate-phosphorus ranged from zero to 0.74 mg/ℓ ; the values for total phosphorus ranged from zero to 0.99 mg/ℓ . The values for nitrate-nitrogen varied between zero and 0.17 mg/ℓ.

The conductivity values for the Yampa River are indicative of its concentrations of total dissolved solids. These concentrations usually range between 54 percent and 96 percent of the value for conductivity (Hem, 1970). Consequently, it is noteworthy that the conductivity values average around 280 for stations Y1 through Y3 and around 370 for the remaining stations (Study Map 1). This observation implies that urban runoff from the city of Steamboat Springs is responsible for increasing total dissolved solids in the Yampa River, perhaps by as much as one-third. Another possibility is that the sulfur springs within the city are causing it.

The tributaries of the Yampa were all within the standards for B_1 streams. Their conductivity values were lower than the Yampa River sites, which indicates they contain fewer dissolved solids.

TABLE VIII

WATER QUALITY OF YAMPA RIVER BASIN[1]

September 23, 24, 1975

Station Number	Instantaneous Flow CFS	Sample Value	Temp. °C.	Conductivity umhos/cm	pH	Dissolved Oxygen mg/l	$NO_2(N)-NO_3(N)$ mg/l	NH_3-N mg/l	Organic N mg/l	PO_4-P mg/l	Total P mg/l	Total Coliforms per 100 ml	Fecal Coliforms per 100 ml	BOD 5-day mg/l
Y1	98	Min. Max.	6.5 11.5	280 290	8.4 8.8	7.0 9.8	0.01	0	0.19	0.02	0.04	60	31	0.8 1.4
T1	1.2	Min. Max.	7.0 17.0	50 75	7.8 8.9	7.1 9.6	0	0	0.15	0.01	0.02	6	2	0.4
Y2		Min. Max.	11.0 12.5	275	8.6 8.8	7.8 9.5	0.01	0	0.23	0.04	0.04			
E1	0.8 to 1.6	Min. Max.	7.0 23.0	310 420	7.3 8.7	5.8 17.6	0.04 0.06	16.0 18.0	4.0 19.0	7.2 7.4	8.7 9.6	2.2 x 10^6	0.28 x 10^6	53 55
T2	1.6	Min. Max.	4.0 14.0	50	7.8 8.3	7.4 9.2	0	0	0.08	0.01	0.01	16	1	0.4
T3	0.5	Min. Max.	6.5 13.0	50	7.6 8.0	7.6 8.5	0	0	0.08	0.01	0.01	33	9	0.8
Y3	111	Min. Max.	6.5 13.5	260 288	8.3 9.0	7.2 9.3	0.01 0.02	0 0.07	0.25 0.65	0.03 0.12	0.05 0.19	820	74	1.6 4.8
T4	0.8	Min. Max.	6.0 8.5	105 195	7.4 8.0	9.6	0.02 0.04	0	0.14 0.55	0.01 0.03	0.02 0.05	3200	0	0.9
T5	1.6	Min. Max.	4.5 11.5	180 220	6.4 7.4	8.0 10.8	0.04	0	0.14	0.01	0.02	90	34	0.6
Y4	97	Min. Max.	7.0 13.5	350 375	7.1 8.1	7.9 10.2	0 0.03	0 0.03	0.30 0.84	0.01 0.11	0.05 0.16	1000	86	1.4 4.0
E2	1.7	Min. Max.	10.0 17.0	320 410	7.2 8.7	5.0 16.0	0.34 0.43	7.7 8.4	1.4 6.2	2.7 2.8	3.4 3.9	21,000	1000	7.4 16.0
Y5	99	Min. Max.	7.0 14.5	360 380	7.2 8.7	7.8 13.2	0.09 0.17	1.4 2.1	1.2 1.8	0.65 0.74	0.89 0.99	4,900	460	3.2 7.2
E3	0.01	Min. Max.	8.0 17.0	160 800	7.3 8.8	5.6 12.4	24	0.16	4.3	14			500 700	10 17
E4	0.01 to 0.03	Min. Max.	8.0 16.0	850 1200	7.2 7.9	1.0 4.4	2.4 4.7	2.4 4.7	0.3 7.3	3.6 11	8.7 28	270,000	20,000	29 71
Y6	104	Min. Max.	6.5 14.0	370 380	7.2 8.9	7.4 11.6	0.03 0.05	0 0.07	0.31 0.67	0.06 0.14	0.10 0.18	380 3,500	88 370	1.5 2.9
E5	0.12	Min. Max.	8.0 22.0	700 900	7.1 7.6	1.0 6.2	4.5 4.7	0 0.08	4.4 5.1	8.6 9.1	10 11	1.1 x 10^6	58,000	14 45
Y7	94	Min. Max.	7.0 14.0	360 380	7.8 8.9	7.2 11.4	0.01 0.05	0 0.08	0.38 4.6	0.02 0.10	0.09 0.24	330	130	1.3 2.7
Y8	104	Min. Max.	7.5 14.0	270 380	8.2 9.1	7.0 10.7	0.01 0.02	0 0.03	0.31 1.4	0.04 0.14	0.10 0.16	92	60	1.8 3.8

[1] This data is preliminary information provided by the USGS; it is subject to further verificati on by their technical staff.

Groundwater

Most of the groundwaters in the project area are found in rock layers mentioned in the Geology section. These layers are termed Morrison and Dakota formations, Mancos Shale, Browns Park formation and alluvium. Small quantities of additional groundwaters may be found in the granite east of Steamboat Springs.

Only a few wells have been drilled into the Morrison and Dakota formations near Steamboat Springs. Water in the Morrison often contains high concentrations of organic matter, which is associated with high levels of hydrogen sulfide. This compound causes water to have a bad taste or bad smell. Water conditions in the Dakota formation are largely unknown, but it should be productive and potable since the Dakota is an important aquifer elsewhere in the state.

Some wells have been drilled into the area's Mancos Shale and Browns Park formations. Those in the Mancos Shale are located near the Steamboat Springs airport, where production is usually less than five gallons per minute (gpm). Their water quality is usually poor due to excessive hydrogen sulfide. Wells in the Browns Park formation are quite variable in both production and quality. Their yields vary from ¼ to 350 gpm; their quality is best near areas of active surface recharge.

The alluvium is the formation that could receive the most impact from land treatment. It is highly variable in its rock composition and in its well yields. Some wells produce a few gpm while others produce from 150 to 200 gpm. The recharge of these wells is good along the Yampa River, where its rate is dependent on quantity of the surface runoff and on rates of irrigation.

The water table in the alluvium is best known by the USGS. They have mapped its general contours from their local knowledge of stratigraphy and well water levels (Study Map 1). These contours are not absolute, however, since the spring runoff would cause them to rise and summer dry spells, to decline.

Water quality of wells in the alluvium is generally excellent. Studies by Wright-McLaughlin Engineers corroborate this, yet they have found some wells to be high in total hardness, manganese and iron (October 1975). The USGS also found high levels of manganese and hardness but not of iron (Table IX). Concentrations of iron and manganese in these studies are considered to be high because they exceed the EPA's proposed drinking water standards (EPA Interim Primary Drinking Water Standards, Federal Register, 1975). Values for hardness are considered high since they exceed the USGS standard of 120 mg/l (Hem, 1970). High hardness values also imply high concentrations of calcium and magnesium.

TABLE [illegible]

GROUNDWATER QUALITY NEAR STEAMBOAT SPRINGS

	Well #1	Well #2	Well #3	EPA Drinking Water Standards
Collection Date	8/28/75	8/15/75	8/20/75	
Depth to Surface	25'	25'	55'	
Water Temp. °C	12.5	17.0	14.0	
pH	7.5	6.8	7.4	
Total Hardness as $CaCO_3$ mg/l	150	88	61	
Calcium mg/l	43	27	17	
Magnesium mg/l	10	4.9	4.5	125
Sodium mg/l	22	7.9	6.4	
Potassium mg/l	2.5	1.3	1.7	
Total Alkalinity as $CaCO_3$ mg/l	123	94	75	
Bicarbonate mg/l	150	115	91	
Chloride mg/l	8.6	0.5	2	250
Sulfate mg/l	66	8.1	1.7	250
Fluoride mg/l	0.3	0.1	0.1	1.1-1.8
$NO_2 + NO_3$ as N mg/l	0.02	0.52	0.11	10 (NO_3-N)
PO_4 mg/l	0.03	0.12	0.13	

	Well #1	Well #2	Well #3	EPA Drinking Water Standards
Collection Date	8/28/75	8/15/75	8/20/75	
Silica mg/l	17	18	26	
Arsenic mg/l	0.001	0	0	0.1
Cadmium mg/l	0.001			0.01
Iron mg/l	0.04	0.04	0.14	0.3
Lead mg/l	0.001			0.05
Manganese mg/l	0.54	0	0.03	0.05
Mercury mg/l	0			0.002
Molybdenum mg/l	0.001			
Nickel mg/l	0.002			
Selenium mg/l	0	0	0	0.01
Vanadium mg/l	0.0004	0	0	0.01
Zinc mg/l	0.08			5
Conductivity umhos/cm	420	230	140	
TDS mg/l		127		500
SAR	0.8	0.4		

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Except for iron and manganese, concentrations of trace metals in these waters are generally low enough to be within the proposed EPA drinking water standards. Nitrate levels are also acceptable. This condition indicates that groundwaters in the Yampa River alluvium could accept some limited irrigation loading from trace metals and nitrates.

This latter parameter is critical since nitrates are known to leach readily into groundwater. Once they reach this environment, their residency time could be hundreds or thousands of years. Consequently, if the land treatment alternative is chosen, without using underdrains, application rates must be designed so that all applied nitrates can be absorbed by the plants or gasified into the atmosphere. Calculations used to determine application rates should account for all nitrogenous compounds, including ammonia and nitrite. These latter two should be considered since soil bacteria can convert them to nitrates and make them available to plants or to the groundwater. If underdrains are employed in a land treatment approach, the concern for nitrates shifts to the surface waters. These underdrains would create another point source of discharge as discussed in the evaluation of Alternatives chapter.

Point and Nonpoint Sources

The purpose of this section is to describe discharges into the Yampa River, originating from the present sewage treatment systems and other significant sources. The first discussion covers discharges from the following sources: Steamboat Springs, Mt. Werner District, Steamboat II District, Bear Pole Ranch, Mineral Springs at Steamboat Springs, KOA Campground, Sleepy Bear Park, SSRSA Urban Runoff and mineral springs. Those discharges from the sewage treatment facilities are then analyzed for their compliance with present and future permits. The next discussion features water management and the problem of handling inflow/infiltration within the collection system. Finally, the overall SSRSA summer and winter material balance is discussed and evaluated in the context of existing information.

City of Steamboat Springs

The Steamboat Springs Plant basically serves the old city of Steamboat Springs. It also serves the Riverside district, the Fish Creek district, the Tree Haus District, and any excess flows greater than 120,000 gallons per day (gpd) from the Mt. Werner plant, via an interceptor constructed in 1974. The original facility was completed in 1967 and basically consisted of a two-stage aerated lagoon system. Between 1973 and 1974, a significant expansion to the original plant was engineered and constructed. The design flow for this new system was 1.65 million gallons per day (MGD) with peak flows of 2.08 MGD.

This new system consists of an aerated lagoon that is followed by clarification chamber, equipped with a sludge return system to the first aeration basin. The clarification chamber is then followed by a 3.8-day-polishing pond, before discharge to the Yampa River. Chlorination for pathogen control is not accomplished in a conventional contact unit but instead the chlorine solution is added at any one of three inlet points to the final polishing pond. Data collected by the Colorado Department of Health and the USGS is presented in Tables VIII and X; it shows that Steamboat Springs chlorination has not been consistently effective in controlling fecal coliforms.

Sludge disposal requirements for this type of treatment unit are minimal. Sludge is slowly collected on the bottom of the ponds and then removed once every three or four years. In the past this sludge has been spread on surrounding agricultural land.

The Steamboat Springs Plant has a nominal design capacity of 1.65 MGD with peak flow capacities of just under 2.1 MGD. Flow rates exceeding these design rates occur at the plant due to high infiltration and inflow rates averaging between 0.9-1.8 MGD. Thus, the overall hydraulic loading on the plant is affected dramatically by these sources. A schematic diagram of the Steamboat Springs facility is given in Figure 4. All sanitary sewage flows to the plant are by gravity except for flow from the small Riverside District.

Mt. Werner Water and Sanitation District

The Mt. Werner District was initially formed in 1965; construction of a collection system began in 1967 and the original sewage plant installation was in 1968. The Mt. Werner facility is an aerated lagoon-polishing pond system and is located on the north bank of the Yampa River, just south of the D&RGW RR tracks. Practically all sanitary sewage flows to this plant by gravity. The design capacity of the plant if 100,000 gpd. The Mt. Werner system also serves the Tree Haus Water and Sanitation District.

As development in the Mt. Werner area continued during the early 1970s, the system became overloaded. Thus, an interceptor was constructed in 1973 to divert and convey all flows greater than 120,000 gpd to the City of Steamboat Springs plant.

The present treatment plant consists of an aerated lagoon followed in series by a polishing pond. No pretreatment is provided. The aerated section of the plant lagoon has a detention time of 22 days at design rates. The effluent from that section then flows to a plain polishing pond that provides approximately another 37-day detention time, prior to discharge. Flow rates to the lagoon in the spring of 1974 ran as high as 500,000 gpd with infiltration flows as high as 300,000 gpd. During the peak Christmas tourist season of 1974-75, average flows

TABLE X

COLORADO DEPARTMENT OF HEALTH
WATER POLLUTION CONTROL DIVISION
RECENT PLANT EFFLUENT WATER QUALITY TESTS

Date Sampled	Time Sampled	pH (Std. Units)	Dissolved Oxygen mg/l	Residual Chlorine mg/l	Turbidity (JTU)	Settleable Solids mg/l	Suspended Solids mg/l	Fecal Coliform per 100/l	BOD mg/l	Color (Units)	Oil & Grease mg/l	Temp. °F	Ammonia mg/l	Total Phos. mg/l	Total Volatile Solids mg/l	COD mg/l	Flow (MGD)	Total Solids mg/l	Type of Sample hr. comp	[illegible]
WASTE DISCHARGE STDS		6-9	2.0 (min)	*0.1-0.5	30 (max)	0.5 (max)	30 (max)	**5000	30 (max)	30 (max)	10.0 (max)									
STEAMBOAT SPRINGS																				
11/20/74	0900 1445	7.4	10.2		10	0.1	36	2200	28	30		39		6.84	77			281	6	3'
3/ 5/75	1100 1700	7.7	3.2	--	15	0.1	14	22,000	27***	25		43	15	4.1			2.7		8	
MOUNT WERNER																				
2/28/74	1050 1800	7.3	1.2	0	6.4	<0.1	26	2200	21	5	4					50			8	
5/22/74	0900 1400	8.3	9.0	--	11.0	<0.1	31	880	29	40									6	
3/17/75	0900 1500	7.6	3.6	0.0	--	--	--	22,000	--	--	--	39	--	--			226		8	
KOA CAMPGROUND																				
10/16/73	0950 1540	--	8.2		26.0	0.7	120	2400	36.5	50	5.3					142			7	
6/18/74	0830 1330	6.8	2.5	0.2	23		78	220,000	46	10							.0015		6	
SLEEPY BEAR																				
5/ 8/74	0830 1430	7.3	2.2		3.2	<0.1	14	220,000	16	8									6	
12/17/74	0915 1515	7.7	2.2	0.0	3.6	<0.1	11	5000	30	30		50	.7	8.8	116			611	6	10
STEAMBOAT II																				
11/20/74	0930 1430	7.7	4.8	0.2	8.1	0.1	24	2400	12	10		45	4.6	11.1	151			657	6	20
3/17/75	0945 1545	7.6	5.7	0.4	38	18	19	380	66	5	--	44	4.1	5.5					8	

* Applicable if wastewater is disinfected with chlorine
** Receiving waters classified B_1 have a maximum limitation of 1000/100ml
*** Results in 615 lbs. BOD load which exceeds permit allocation

Compliance with Colorado Standards for the Discharge of Wastes shall normally be based on 6-hour composite samples. If grab samples are taken, no parameter limitation shall be exceeded by more than 50% of the limitation.

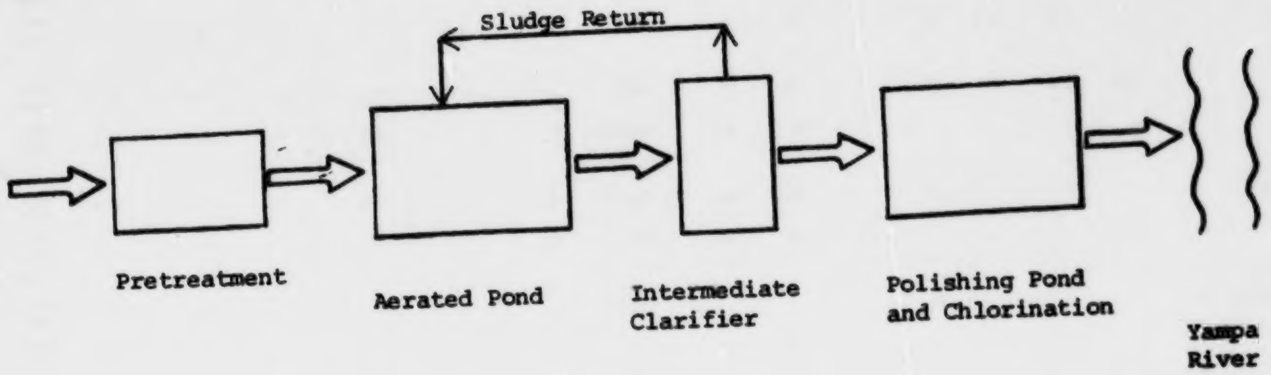
Sludge Return
Pretreatment
Aerated Pond
Intermediate Clarifier
Polishing Pond and Chlorination
Yampa River

FIGURE 4

STEAMBOAT SPRINGS TREATMENT PLANT
SCHEMATIC FLOW DIAGRAM

of 400,000 gpd were noted with peak flows as high as 956,000 gpd. A process flow schematic of the Mt. Werner lagoon is given in Figure 5.

The bypass of excess flows to the City of Steamboat Springs plant has been on of the keys to a reasonably successful operation of the Mt. Werner facility. The treatment levels achieved at this plant since the bypass have been generally good. A summary of effluent testing by the Colorado Water Quality Division is given in Table X. A comparison with the regulations shows the plant to periodically be in violations of its suspended solids and BOD limitations. Adequate disinfection has also been lacking as the plant fairly consistently violates this standard. Consequently, these facilities will not be able to meet the 1977 standards for suspended solids, BOD_5 and NH_3.

Steamboat II Water and Sanitation District

The Steamboat II District sewage treatment plant is situated on the northwest side of the study area on a 3.6-acre site, located between the D & RG railroad tracks and the Yampa River. The collected sewage from the Steamboat II development flows by gravity to the plant site--where it must be lifted into the plant. It has design capacity of 75,000 gpd and consists of three small package units, each having a capacity of 25,000 gpd. The first module was put into service in 1971; the second and third units, between 1973 and 1974. Extended aeration is the basic process employed in these units and the three units operate in parallel. The sewage flow is sent directly to one of the three aeration basins and then on to the clarifier section. No pretreatment of grit removal is provided. The flow is then collected and sent to the polishing pond, chlorinated and discharged. The plant's aeration capability and sludge removal is not good between the various parallel units because of inadequate piping.

The effluent water quality from the Steamboat II plant has periodically been in violation of the current discharge permit. A summary of effluent water quality testing by the Colorado Water Quality Control Division and the USGS is given in Tables VIII and X; additional data documenting past plant performance is available in the 201 Facilities Volume One report. The suspended solids, BOD, and fecal coliform parameter standards have often been violated in the past. If a program for upgrading this system is not initiated, the effluent wastewater quality will continue to be in non-compliance with Colorado State regulations. With proper operator attention, a plant of this type can provide adequate secondary treatment. However, it is not readily amendable to incorporation into a long range regional sewage treatment facility with advanced treatment requirements. Smaller plants like this one require more money to process a given amount of sewage than a larger one does; plus a network of smaller plants require more people to operate them than one larger plant does.

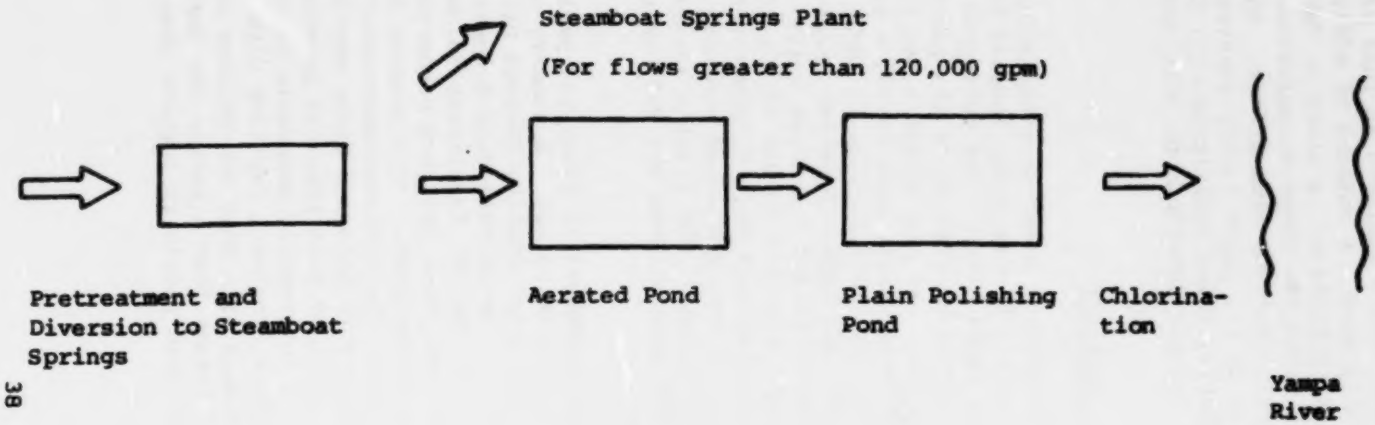
Steamboat Springs Plant
(For flows greater than 120,000 gpm)
Pretreatment and Diversion to Steamboat Springs
Aerated Pond
Plain Polishing Pond
Chlorination
Yampa River

FIGURE 5

MT. WERNER TREATMENT PLANT

SCHEMATIC FLOW DIAGRAM

KOA Park Treatment Plant

The KOA park treatment plant is a package plant, with an extended aeration basin followed by a polishing pond. This unit provides treatment only for the KOA Campground and a sanitary dump station, which results in highly variable loads. The unit was installed in 1974 and the pond was added in 1974; design capacity is 15,000 gpd. Pretreatment is not provided at this facility and the final polishing pond is utilized as a chlorine contact chamber. Effluent data gathered by the Colorado Department of Health and the USGS indicates that the KOA plant is in consistent violation of the State Discharge Standards. A summary of this data is included in Tables VIII and X. Inspection evidence indicates that at times the sludge return is anaerobic and that overall plant operability is poor. With proper operation attention, a plant of this type can provide adequate secondary treatment for flows within design limitations. The system is not, however, amenable to incorporation into a regional facility requiring advanced treatment processes, for the same reasons mentioned for Steamboat II.

Sleepy Bear Trailer Park

The Sleepy Bear Plant provides treatment services for the Sleepy Bear Trailer Park, which is located 0.2 miles downstream of the KOA plant. Its process is an extended aeration-activated sludge type, with design flow of 15,000 gallons per day. It is essentially the same type of unit as the KOA plant previously described. No polishing pond has been added, however. Chlorination consists of adding hypochlorite tablets to the clarifier weir trough.

As shown in Tables VIII and X, effluent monitoring data (1974-1975) indicate that in the past the plant has generally been in compliance with the suspended solids and BOD parameter limitations as governed by the State Discharge Standards. Disinfection treatment levels have not been adequate, however, and the plant has been in violation for this parameter. Again, this type of plant can provide adequate secondary treatment under the proper operating conditions but it is not amenable to incorporation into a regional wastewater facility requiring advanced treatment.

Bear Pole Ranch & Stephens Perry Mansfield School

The Bear Pole Ranch is located in Strawberry Park, about two and one-half miles northeast of the Steamboat Springs sewage lagoons, and has a maximum peak population of about 130 persons. The extended aeration facilities for the ranch were constructed in 1972 and then modified in 1975. The rated capacity of the system is 15,000 gpd although flows to the facility are usually less. The system consists of five underground aeration vaults and a sixth vault for chlorination-disinfection. A polishing pond provides a 3½-day detention time, then further treats the effluent before discharge to a nearby irrigation ditch.

The polishing is susceptible to algae accumulations and subsequently, suspended solids problems occur during certain times of the year. The facility appears to be operating efficiently although no water quality testing has been done since the 1975 improvements.

The Stephens/Perry Mansfield School is also located in Strawberry Park on the west side of the valley. This school is open only for the summer with programs in art and recreation. The maximum population is approximately 200 residents. Currently, their sewage facilities consist of about 25 separate septic systems that appear to be operating properly. However, some groundwater pollution probably does result from the leaching fields.

The current sewage facilities at both the Bear Pole Ranch and the Stephens/Perry Mansfield School are currently operating in a reasonably satisfactory manner. Because of their remote location, it is not advisable to attempt to tie these facilities into the proposed SSRSA treatment system. In the future, a land treatment irrigation advanced waste treatment scheme might be advisable.

SSRSA Urban Runoff

There is no question that the various point source discharges listed above contribute significant pollutant loadings on the Yampa River. In addition to these, however, studies performed by Wright-McLaughlin Engineers indicate that non-point sources also contribute substantial loadings to the area waterways. As might be expected, runoff from rainfall and snowmelt does become contaminated to varying degrees with pollutants from urban activities as it makes its way across rooftops, gutters, pavement, and lawns. Traffic, air pollution, animals, and humans and general urban activities continually provide a source of pollutants to be picked up during the next runoff event; the primary pollutants are similar to those found in normal sanitary sewage although perhaps in more dilute concentrations. Stormwater or snowmelt runoff is particularly damaging to certain segments of the receiving stream quality because it generally occurs in large volumes and thus produces a shock loading effect.

Wright-McLaughlin Engineers (October 1975) have carried out extensive investigations into the quality and quantity of these runoff flows. Their investigations involved both field sampling and computer modelling, using the Corp of Engineers "Storm" model. To facilitate this effort the SSRSA was divided up into various segments according to residential, commercial, and industrial uses. To put the results into a reasonable perspective, it is useful to compare the total runoff contribution on an annual basis to that of the previously mentioned point sources. These comparisons are given in Table XI.

TABLE XI

COMPARATIVE POLLUTANT LOADINGS
Urban Runoff vs. Point Source

	BOD (lbs/yr)	SS (lbs/yr)
Point Source (Based on 1983 Proposed Allocations)	86,870	86,870
Non-Point Source (1985 Results--"Storm" Model --Total SSRA urban area)	48,180	302,585
Ratio (Non-Point/Point Source-- Steamboat Springs only)	55.4%	348%

From Table XI it can be seen that the 1985 predictions indicate that almost 3.5 times as many suspended solids will be directed to the Yampa via storm runoff than by point source discharge. Likewise, about one-half as much BOD would be discharged via non-point source flows. Consequently, to maintain a responsible cost-effective approach to the Yampa basin water quality and to maintain the desired water goals, at least minimal control and treatment of non-point source urban runoff should be initiated. Otherwise, the areawide allocation program with its extensive treatment requirements cannot help but lose some of its significance.

Mineral Springs at Steamboat Springs

Mineral springs are apparent at various points along both banks of the Yampa River; the discharge comes from an upturned outcrop of the Dakota Sandstone formation. Discharge is about 3 cfs and the Environmental Protection Agency estimates (1971) the salt loading on the Yampa River from this source is about 24 tons per day. The flow is also high in fluorides. Although the discharge does have a small impact on the Colorado River salinity, the springs also provide a natural aesthetic asset to the area.

Summary--Compliance with Current and Future Legal Limitations

As noted in the previous discussions, most of the SSRSA treatment facilities are periodically in non-compliance with their current wastewater discharge permits. As discussed earlier in the Water Quality Goals section, the Green River Basin Plan developed and assigned discharge allocations for the biochemical oxygen demand. These allocations are scheduled to take effect on July 1, 1977 although some of these allocations have already been written into current permits with implementation dates prior to July 1977. Compliance with these requirements is shown in Table XII for SSRSA facilities. This table shows that the current BOD limitations are only complied with at Steamboat Springs and Mt. Werner, and occasionally at Sleepy Bear. When the load allocations are implemented in future permits, none of the existing facilities are expected to comply. For suspended solids, only Steamboat II and Sleepy Bear regularly comply with the existing permits and only Sleepy Bear would be expected to comply with future permit limitations after July 1977. None of the existing systems perform well with regard to coliform discharges and none of them would be expected to meet future ammonia discharges without additional removal equipment.

Water Management

Both the City of Steamboat Springs (including the Fish Creek Water and Sanitation District) and Mt. Werner divert water from Fish Creek for their potable water source. The City also has a 1,800 acre-feet reservoir near the Continental Divide from which it also draws water for domestic uses. Steamboat II, on the other hand, draws its supply from a well on the Yampa River floodplain. Principal uses for this water would include water for normal domestic uses and also for irrigation during the summer months.

An entire regional water system essentially acts as an interrelated supply and treatment system. Water quantities used must be treated, so the key to a sound and successful water management program does not solely rely on capital intensive water system improvements. For instance, because water consumption has been found to be a function of cost and general public awareness a more active "water conservation" awareness is usually facilitated by metered water systems, as contrasted to a flat rate billing system. The Steamboat Springs water system is currently not metered although proposals to initiate such a system have been suggested. Winter bleeding is a fairly common practice in the older sections of the City where freezing lines are a problem during the winter.

A second water system management technique is related to the control of undesired infiltration/inflows (I/I) into the sewage collection systems to the various treatment plants. If such flows can be minimized, less wastewater need be treated before discharge and overall treatment efficiency is improved. For example, the sanitary sewage flow at Steamboat Springs is currently estimated to be 0.27 MGD with I/I flows averaging between 0.9 - 1.8 MGD. Obviously I/I flows are often quite significant in this system.

The sources of I/I are cracked or broken pipe, improperly grouted connections, poor insulations, leaking manholes and roof drains. The main sources in the SSRSA area are infiltration into sewer lines and

TABLE XII

SUMMARY--COMPLIANCE OF SSRSA TREATMENT FACILITIES WITH CURRENT AND FUTURE PERMIT CONDITIONS

		Parameter			
Treatment Facility		BOD_5	Suspended Solids	(Fecal Coliforms) Disinfection	NH_3
Steamboat Springs	Current	Yes	No-- (periodically)	No	No
	Future	No	No	No	No
Mt. Werner	Current	Yes	No-- (periodically)	No	No
	Future	No	No	No	No
Steamboat II	Current	No	Yes	No	No
	Future	No	No (possibly)	No	No
KOA	Current	No	No	No	No
	Future	No	No	No	No
Sleepy Bear	Current	No-- (periodically)	Yes	No	No
	Future	No	Yes	No	No

manholes, plus inflow from winter bleeding. Winter bleeding occurs when water users allow water to continuously flow through their pipes to prevent them from freezing during the winter. McCall, Ellingson and Morril estimated this amount to be 0.57 mgd during the months of December through April. Dismuke & Dismuke, Consulting Engineers, and Wright-McLaughlin Engineers investigated the infiltration during those months and found it contributes 0.66 mgd, for a total 1.23 mgd during the winter periods. These values increase even more during the spring runoff when I/I flows can peak to 3.715 mgd and average at 2.36 mgd. An estimate of all these flows is given for the entire SSRSA study in Table XIII; it does not include the winter bleeding of 0.57 mgd.

TABLE XIII

1975 I&I FLOWS (1,000 gpd)*

Basin	Basin Name	May Peak	May Base	Winter Infiltration
1.	Steamboat II	125	50	10
2.	Sleepy Bear/KOA	neg	neg	neg
3.	Dear Mtn./Elk River	na	na	na
4.	Riverside	25	10	10
5,6.	West Steamboat/Fairview	60	50	20
7.	Steamboat	2,645	1,870	500
8.	Willett Heights	15	10	neg
9.	Fish Creek	30	20	neg
10.	Tree Haus	30	15	neg
11,12,13.	Mt. Werner & Interceptor	785	335	120
	Total SSRSA	3,715	2,360	660*

*Plus 570 winter bleeding equals a total winter I/I of 1,230
neg means a negligible amount
na means not applicable

In order to arrest the problem of winter bleeding, the Public Works Department of Steamboat Springs is working on two programs. One replaces some of the older lines to reduce leaks and to place them below the frost line. Another program installs metering devices to encourage water conservation. Their programs are intended to reduce winter bleeding as much as 50 percent.

The most important locations for I/I are the older areas of Steamboat Springs and Mt. Werner Water and Sanitation Districts. Corrective measures are deemed cost effective in these areas and should be undertaken. Wright-McLaughlin proposes that Steamboat's older lines be replaced with new ones paralleling the older ones. The older ones would remain as underdrains and would discharge into the Yampa River drainage. Such a system would cost approximately $23,000, including 25 percent for contingencies. The Mt. Werner improvement would cost less ($33,000) and would consist mainly of grouting existing pipe, replacing it and providing liners.

These improvements are designed to reduce peak I/I flow in May by 1.64 mgd, reaching a level of 2.075 mgd. The May base would be reduced to 1.269 mgd, a loss of 1.1 mgd. Reductions for the winter would amount to 0.46 mgd, bringing the level down to 0.2 mgd. This latter value is especially important to future treatment since highest wastewater flows would occur during the winter. A summary of these improvements is shown in Table XIV. This table shows a 55 percent annual reduction in I/I (208 million gallons), excluding winter bleeding. It would cost an estimated 14.3¢ per 1000 gallons, clearly cost effective when compared to the cost for additional treatment facilities, varying from 34.8 to 38.8¢ per 1000 gallons (Wright-McLaughlin Egineers, April 1976).

TABLE XIV

Estimated Present and Future I&I Flows
(1000 gpd)

	PRESENT ESTIMATE				PROJECTION AFTER IMPROVEMENTS			
	Sewer I&I				Sewer I&I			
MONTH	% of May Peak	Aug. Flow	Winter Bleeding	Total	% of May Peak	Aug. Flow	Winter Bleeding	Total
January	18	660	570	1230	10	200	400	600
February	18	660	570	1230	10	200	400	600
March	22	820	570	1390	18	370	400	770
April	36	1340	570	1910	29	600	400	1000
May	64	2360	-	2360	61	1260	-	1260
June	45	1670	-	1670	45	930	-	930
July	32	1190	-	1190	28	580	-	580
August	21	780	-	780	16	330	-	330
September	20	740	-	740	14	290	-	290
October	20	740	-	740	12	250	-	250
November	19	710	-	710	11	230	-	230
December	18	660	570	1230	10	200	400	600
Annual Flow		375 MG	87 MG	462 MG		167 MG	61 MG	228 MG

(MG means million gallons)

Water Material Balance

The flow of domestic water into the Steamboat Springs system does not equal or balance the amount flowing out of the system. Wright-McLaughlin Engineers have determined that 0.68 mgd of domestic water flows through the city's wastewater treatment plant (April 1976), while city officials contend that about 1.6 mgd of domestic water is supplied to the system. These figures suggest that 57.5 percent of the incoming water is lost from the system although usual losses vary between 20 and 40 percent (Metcalf and Eddy, 1972). The reasons for this disparity are unknown and would require additional study to elucidate.

III. Financial Condition of the Districts

The Steamboat Springs wastewater management planning area contains the City of Steamboat Springs, six special districts (Mount Werner, Fish Creek, Tree Haus, West Steamboat, Riverside, and Steamboat II) and three private businesses operating their own systems (Sleepy Bear, KOA Campground, and Bear Pole Ranch). Steamboat II, Sleepy Bear, and KOA Campground operate their own package treatment plants discharging into the Yampa River, the Mount Werner operates a limited capacity (0.12 mgd) treatment plant. Most of the Mount Werner sewage and all sewage from the other special districts is treated, under agreement, by the City of Steamboat Springs Sewage Treatment Facilities. The Bear Pole Ranch, located north of Steamboat Springs, operates its own package treatment plant discharging into Butcherknife Creek, a tributary of the Yampa.

Despite considerable financial investment in wastewater treatment facilities over the past several years, to an extent that threatens bankruptcy to some ill-planned districts (see below), none of the facilities in the planning area meets Colorado effluent standards that existed prior to July 1, 1975, for reasons of undercapacity, infiltration and improper operation. (Wright-McLaughlin Engineers, October 1975).

SSRSA Entities

Four of the entities in the planning area will not be included in the financial analysis which follows, since they are not special quasi-municipal districts as described in Title 32 of Colorado Revised Statutes. Some pertinent comments on these entities follow:

City of Steamboat Springs

The City wastewater treatment system was originally constructed in 1967 with a major expansion in 1973-74. Although it does not meet current state effluent standards it can be considered as a major secondary treatment plant in the future consolidated systems. The City's sewage collection system is generally in poor condition. The City of Steamboat Springs in 1975 had a levy of 15 mills for all municipal purposes on an assessed valuation of $23,663,190 (Abstracts of Assessments, 1975).

Sleepy Bear

The Sleepy Bear Park Sewage Treatment Plant is privately owned and serves a 53-unit mobile home park. The plant does not meet current state effluent standards and is not adaptable to long-term use in the future consolidated system.

KOA Campground

The KOA Campground treatment plant, built in 1974, is privately owned and serves 21 permanent and 40 transient mobile home spaces. The plant, which has a current depreciated value of $16,842, does not meet current state effluent standards and has no long-range value for incorporation into the future consolidated system.

Bear Pole Ranch

The Bear Pole Ranch wastewater treatment facilities, built in 1972 and remodeled in 1975, serve a year-round ranch/camp with a peak maximum population of 130. Although it does not meet current state effluent standards for suspended solids (due to algae) it is operating below capacity and is recommended to continue operation with supplementary land treatment of effluent, under the ultimate master wastewater plan. (Ibid., pp. V-14, V-15.)

The Six Special Sanitation Districts

The six special sanitation (actually, all are combined water and sanitation) districts in the study area vary considerably as to financial health but considered as a group they are in hazardous condition with relatively high mill levies, uncollectible debts, rapidly escalating (i.e., "ballooning") debt service payments on present bonded indebtedness, and physically deteriorating facilities. Worse, the sewage collection and treatment systems for which they incurred this debt, many constructed within the last five years, need major repair or complete replacement under the master regional wastewater plan. The special districts in the worst financial condition--one of them has already defaulted on its outstanding bonds--are classical examples of the dangers of speculative resort subdivisions, created by optimistic resort land developers and sold to gullible buyers. Success of such ventures appears to require an ever-expanding boom economy with limitless new buyers from outside the area, or careful state and local controls over the planning of such developments. Neither condition has existed in most resort boom areas of Colorado during the 1970's.

A brief description of each of the six special districts, as well as the City of Steamboat Springs, taken from the latest available financial reports, follows:

Mt. Werner Water and Sanitation District: This is the largest and financially soundest of the six districts. It has $2,575,000 in bonded indebtedness (following a refunding issue). The schedule of payments avoids unusual peaks, is current, and the present annual payments of $260,885 appear to be comfortably affordable under the district's current income structure. The recent trend in assessed valuation and levy is:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue*
1973	$9,976,660	.012	$119,720
1974	13,151,710	.012	157,820
1975	14,133,210	.012	169,598

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* Nominal tax revenue as shown in the Routt County Abstract of Assessment and Levies, rather than actual tax revenue shown in the financial statements of the district. Tax delinquencies and collection fees account for some of the difference.

West Steamboat Water and Sanitation District: This is a relatively new district, which began on October 16, 1973 and has thus far issued only a single financial statement for the period ending December 31, 1974. The district issued $210,000 in bonds. The first redemption of $1,000 is due in 1976. The redemption amount rises in steps to $10,000 in 1983 and $30,000 in 1993. The trend in valuation and tax levy is:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue
1973	(Not in Existence)		
1974	$671,470	.008	$5,372
1975	862,340	.015	12,935

Riverside Water and Sanitation District: This district has not yet released its 1975 financial statements. As of December 31, 1974 the district had $270,000 of bonds outstanding, with principal payments rising from $5,000 at present in steps to $25,000 in 1990. The 1974 principal and interest payment of $24,250 was met through a transfer of $16,754 remaining in the Capital Projects Fund, $7,000 from the General Fund, and a reduction to $14,104 in the Principal and Interest Trust Fund. An upturn in tap fee and service fee income seemed necessary if the 1975 principal and interest payment were to be met. The trend in valuation and assessments is:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue
1973	$141,270	.020	$2,825
1974	156,660	.020	3,133
1975	178,550	.020	3,571

Steamboat II Water and Sanitation District: This district has not yet released its 1975 financial statements. Its 1974 financial statements were unaudited, yet show the district to be in critical financial condition. The district had two bond issues outstanding before 1974, totalling $476,000 plus interest. Its ability to meet the 1974 principal and interest payments of $51,194 was assisted by issuance of a new bond issue of $59,000 less $5,900 underwriting fee. This new issue is repaid at $1,000 annually plus interest until a 1990 balloon payment of $45,000.

The current assets of Steamboat II consist primarily of accounts receivable totalling $32,438. Of this amount, $23,345 is receivable from two developers and although liens have been filed, the accountant's report states that "payment appears doubtful." A further judgment of $44,538 against the Steamboat II developer was still unsatisfied on September 12, 1975 and was not shown as an asset on the 1974 financial statement.

The main source of revenue for the district is water and sewer service fees, amounting to $238,414 in 1975. The financial impact of future wastewater facility improvements is not yet known.

Fish Creek Water and Sanitation District: The district has not yet released its 1975 financial statements. On December 31, 1974, it had insufficient cash on hand to pay its $5,000 bond payment due 9/1/75. In addition, two notes were unpaid: one for $28,696 due 4/1/75, and one for $7,500 plus 6 percent interest due 11/30/75. In September 1974, the district adopted a policy of charging tap fees and readiness to serve fees against undeveloped property within the district which has water and sewer facilities available. On December 31, 1974, there were $54,211 of such fees accrued and carried as accounts receivable, yet the district's auditor stated: "Collection of these amounts in the foreseeable future appears uncertain as many property owners contest the legality on which the district charged the fees." The district has a total of $610,000 in outstanding bonded indebtedness, and faces ballooning payments of bonds rising to $35,000 in 1982 and $70,000 in 1992, plus interest. The property tax levy has risen markedly in recent years, but the latest tax revenue has dropped because of a drop in assessed valuation:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue
1973	$ 979,350	.010	$9,794
1974	1,131,010	.025	28,275
1975	914,950	.027	24,704

Tree Haus Water and Sanitation District: This district has $575,000 in outstanding bonds, payable at $5,000 in principal (plus about $50,000 in interest) annually through 1979. Beginning in 1980, the principal payments balloon to $35,000 and grow to $70,000 by 1990. The developer of Tree Haus in 1972 entered into a "Guaranty of Payment of Tap Fees," but has met a large portion of this agreement by transferring title to the pumphouse and sewer easement to the district and by assigning notes to the district, amounting to $121,783 on Dec. 31, 1975. Payments of interest is current on the notes, yet the district does not enjoy the liquidity which cash payment of tap fees would provide. The district's trend in valuation and tax levy is:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue
1973	$213,440	.020	$4,269
1974	275,920	.020	5,518
1975	324,790	.01529	4,966

The principal payments on the existing bonded indebtedness balloon from $11,000 (with about $40,000 interest) in 1975 to $26,000 in 1979 to $51,000 in 1988.

The trend in valuation and levy is:

Year	Valuation	Property Tax Levy	Nominal Tax Revenue
1973	$473,030	.010	$ 4,730
1974	487,430	.030	14,623
1975	538,490	.010	5,385

The 1975 drop in tax levy, back to 10 mills, reflects a simultaneous increase in service charge by the district.

Summary of Condition of Facilities

The six special water and sanitation districts currently own wastewater collection facilities that exhibit a high rate of inflow and infiltration and thus require substantial maintenance. Except for Mt. Werner's small (0.12 mgd) treatment plant which does not meet current effluent standards, none of the special districts owns treatment facilities which are considered to have long-term value in the consolidated regional plan. Thus each district will need either: (a) to spend additional funds to improve its own wastewater collection facilities and pay more to have its sewage processed in an upgraded treatment plant; or (b) to merge with other districts into a consolidated sanitation district, paying a share of the costs of constructing and operating the consolidated district's facilities. In either case, a substantial additional financial burden will be placed on the already-burdened special districts. At present, the districts together owe $4,748,000 in principal and are likely to pay at least again as much in interest over the next 18 years (see Table XV).

City of Steamboat Springs

The City's financial condition is sound. Outstanding bonded indebtedness, as of December 31, 1975, is $3,242,000, subdivided as follows:

General Obligation Various Purpose Bonds	$2,285,000
Sales Tax Revenue Bonds	390,000
General Obligation Water Bonds	300,000
General Obligation Sewer Bonds	225,000
Sewer Improvement Revenue Bonds	42,000
	$3,242,000

TABLE XV

CONSOLIDATED SCHEDULE OF PAYMENTS OF PRINCIPAL ON BONDED INDEBTEDNESS SIX WATER AND SANITATION DISTRICTS, STEAMBOAT SPRINGS COLORADO (IN $ THOUSANDS)

YEAR	MT. WERNER	FISH CREEK	TREE HAUS	WEST STEAMBOAT	RIVERSIDE	STEAMBOAT II	TOTAL
1976	80	7	5	1	5	12	110
1977	80	14	5	2	5	22	128
1978	95	17	5	2	10	22	151
1979	110	22	5	2	10	26	175
1980	125	25	35	3	10	26	224
1981	165	30	35	5	10	26	271
1982	195	35	40	5	15	31	321
1983	220	35	45	10	15	36	361
1984	235	30	45	10	15	36	371
1985	240	35	50	10	15	37	387
1986	170	35	55	10	20	41	331
1987	165	40	55	15	20	46	341
1988	160	45	60	15	20	51	351
1989	195	50	65	20	20	61	411
1990	140	55	70	20	25	45	355
1991	50	60		25	25		160
1992	50	70		25	25		170
1993	50			30			80
1994	50						50
TOTAL	2,575	605	575	210	265	518	4,748

This debt amounts to 13.7 percent of 1975 assessed valuation, which is a very conservative debt burden. Some analysts suggest as an upper limit to long-term indebtedness, 10 percent of actual valuation. Present Steamboat Springs indebtedness is only 4.1 percent of actual valuation, assuming a nominal 30 percent assessment ratio as specified in Colorado law.

However, Steamboat Springs now uses a relatively large proportion (21 percent, according to the 1976 Annual Budget) of present revenues for service of bonded debt. Prudence dictates that the City should find new revenue sources to carry the additional bonded indebtedness required to fund needed capital improvements, including water and sewer system improvements. The City Council is considering an election in 1976 to authorize a sales tax increase to meet this need for additional revenue (ibid.).

Steamboat Springs is considering the issuance of $2,734,958 in bonds during the 1976-1980 period to pay for a capital improvements program, as follows:*

Water system bonds	$1,208,000
Wastewater system bonds	555,625
Street and bridge bonds	471,333
Multipurpose building bonds	500,000
Total	$2,734,958

Following these bond issues (and ignoring principal reductions that will occur on present debt before the new bonds are issued) the total bonded debt will be $5,976,958. This represents 25.2 percent of 1975 assessed valuation of the City and about 7.5 percent of 1975 actual valuation. However, the valuations will increase each year, so these percentages will be somewhat less by the time the new bonds are issued. Assuming that a sales tax increase or other new revenue source is found, this bonded debt is not an unreasonable burden for Steamboat Springs.

Future Consolidation of Special Districts

After the Steamboat Springs regional wastewater plan is complete, it is likely that consideration will be given to merger of some or all of the six special districts into a consolidated sanitation district (or water and sanitation district, since all six have both functions). Existence of a single consolidated district probably will provide some economies in administration and operating costs, and would permit better planning for the future of the Steamboat Springs area. Yet there are serious financial as well as political ramifications to creation of a consolidated district which should be addressed.

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*Source: City of Steamboat Springs Proposed Capital Improvements Program 1976-1980, May 18, 1976, p. 46.

Colorado Revised Statutes 32-1-113 establishes the procedure for consolidating two or more existing districts. The procedure requires passage of resolutions, a public hearing, and an election by persons affected. Subsequent to consolidation, other districts can merge with the consolidated district as described in C.R.S. 32-1-119. The bonded indebtedness of each district, at the time it becomes a part of the consolidated district, remains an obligation of the persons owning property within its boundaries. Thus there can be a variable property tax levy within the consolidated district, depending on which predecessor district area the property is in.

There are several other questions of financial equity which must be faced in planning for the consolidated district. If the districts are consolidated, certain existing facilities can be incorporated into the master facilities plan but other facilities will be abandoned. Should the costs of constructing the new facilities be shared equally throughout the consolidated district? Or should an effort be made to adjust the costs according to the value and condition of the facilities which each separate district brings to the consolidation?

How should the operating and maintenance costs of the consolidated district be allocated? Should an extra share of operating costs be allocated to areas of the district which may require pumping of effluent, while others utilize gravity? If one district has collection lines which are in poor condition, with high infiltration and inflow, should a higher share of maintenance costs be allocated than with a district having few maintenance problems?

Finally, what is the likelihood that certain financially healthy districts may agree to "subsidize" districts in weaker financial condition, by agreeing to accept them in the consolidated district? This may be the only alternative to bankruptcy or prohibitively high property taxes for certain districts. If so, the residents of the financially healthy districts may agree to accept the weaker districts either from a sense of community or from a desire to avoid the stigma which a default by one district would bring to all local government bonds in the Steamboat Springs area.

Certain legislation recently adopted or proposed in the Colorado legislature will have a significant impact on the future of special districts in the Steamboat Springs locality. One is S.B. 44 (50th Gen. Assy.), "Concerning the Authorization of Certain Special Districts to Avail Themselves of Federal Bankruptcy Laws." S.B. 44 which became law in 1976, permits water and sanitation districts to file bankruptcy petitions and, with district approval, issue new bonds having lower interest rates and extended payment periods. Such bonds would replace existing bonded debt.

Another bill of interest passed in 1975 is H.B. 1139, which restricts districts from increasing their tax levies to raise more than 107 percent of the previous year's revenue, unless permission is obtained from the Division of Local Government or the district voters in a special election.

Still another bill which was ineligible for consideration in 1976, but is likely to receive considerable support in 1977, is H.B. 1057. This bill, supported by the Colorado Municipal League, would prohibit formation of special districts (including consolidated districts) and provides for the transfer of special district functions to local municipal governments.

In an attempt to resolve the existing financial issue, the following questions must be resolved to develop a viable plan for consolidation.

- What are the financial conditions of the six special districts and what is the likely forecast of the condition, based on expected development and growth in tax base, and anticipated operating costs and debt payments? Is a consolidated district financially feasible? What legislation currently or potentially affects consolidation?
- What are the likely attitudes of the directors of the special districts, their taxpayers, and the city and county officials towards consolidation? Are there serious attitudinal barriers which make consolidation unlikely or impossible?
- If consolidation is feasible, a procedural plan must then be developed showing steps to be taken, costs to be incurred, and dangers to be avoided.

IV. Other Existing Environments

The existing environment of the project area is described in a variety of books and reports and is not repeated here in all its detail. However, its major features are described, and special emphasis is accorded to the aquatic and agricultural environments. The total range of topics includes physiography, geology, soils, biology, climatology, air quality, odor, history, population, land use, socio-economics, transportation, noise, solid waste, demographics, recreation, aesthetics, culture and other federal or state projects.

Physiography

The study area that is delineated by the Steamboat Springs Regional Services Authority encompasses 37½ square miles. Its shape ranges from flat stream valleys to steep mountain slopes. The lowest elevation occurs in the Yampa River floodplain on the west border of the area (6600 ft.) and the highest occurs near its east border, at the base of Mt. Werner (8000 ft.). The river flows through the center of the study area, where it has an average slope of 22 feet per mile and an average floodplain width of 800 feet. Along its floodplain are numerous river terraces, flat mesas and irregularly-shaped plateaus. Tributaries of the Yampa are minor and include Walton, Burgess, Fish, Spring, Butcherknife, Soda and Slate Creeks.

Geology

The geologic history of the area is not of paramount importance to the project although some of its resultant features are mentioned in the section entitled Evaluation of the Alternatives. The major mountain range is called the Park Range and it began its uplift about 60 to 70 million years ago. Since that upthrust, inland seas or rivers have covered the area and deposited softer sedimentary rocks. Most prominent among these rocks are the formations called Morrison, Dakota Sandstone, Mancos Shale and Browns Park.

Along the Yampa River are located layers of unconsolidated material, called alluvium. This material was placed there by glaciers and river flow, and its constituents range from clay-sized particles to large boulders. The southern part of the Yampa River alluvium is comprised of black organic silt and clay, three to eight feet in thickness. Underlying this are layers of gravel-clays, well-sorted sands and gravel. Further to the north the organic layer thins out and by Steamboat Springs it disappears. From this point on, the surface alluvium is mainly sand and gravel, varying in thickness between 20 and 40 feet.

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The major geologic hazards for the project include flooding and earthquakes. The 100-year floodplain is depicted in Study Map 1, which shows the coverage area for a flood occurring with an average frequency of one in 100 years. The ramifications of its occurrence are discussed in the Evaluation of the Alternatives. The possibility of an earthquake in this area is remote but it could happen. The most significant fault in the area extends through Steamboat Springs in a north-south direction and it is not known to be active.

Soils

Many of the soils in the area are good for farming yet they are usually limited by slope and lack of moisture (Charlie Hogue, SCS, Steamboat Springs, personal communication). This latter factor is less easily handled and often leads to erosion. Those areas that are currently irrigated are shown on Study Map 2. However, for the purposes of this discussion, only those sites along the Yampa River, near the Midway Site, are being considered. These sites are shown in Figure 5.

The dark areas in this figure are the valley bottomlands. They are characterized by a shallow loam surface underlaid by sand and gravel; they are subject to a high water table and portions of them are continually wet. The Soil Conservation Service (SCS) has designated these soils as 49A and have rated their agricultural suitability as Class VIw. A description of this class states that soils with this rating would not be suitable for cultivation. However, these soils are currently being cultivated and have been cultivated for many years. Because of this disparity, Wright-McLaughlin Engineers asked the SCS for an explanation. They were told that the current classification is based on the soil temperatures for growing corn. Yet, corn is not grown on these soils along the Yampa Valley.

The light areas in Figure 5 are called the upland terraces and they are designated as soils 2A and 2C. These soils are called the Work Silt Loam series; their surface layer is comprised of well-drained silt loam and their subsurface layer, of silt or silty-clay loam. The SCS has classified their agricultural suitability as IVe for 2A soils and VIe for 2C soils. This classification would mean that the 2A soils would be suitable for cultivation, while the 2C soils would not. However, due to the rationale for developing these ratings, they are not deemed as sufficient evaluations for the land treatment alternatives proposed for the SSRSA.

Biology

The discussion on biology is divided into one section each on aquatic and terrestrial environments, and one on rare and endangered species. The aquatic environment is important because it presently receives

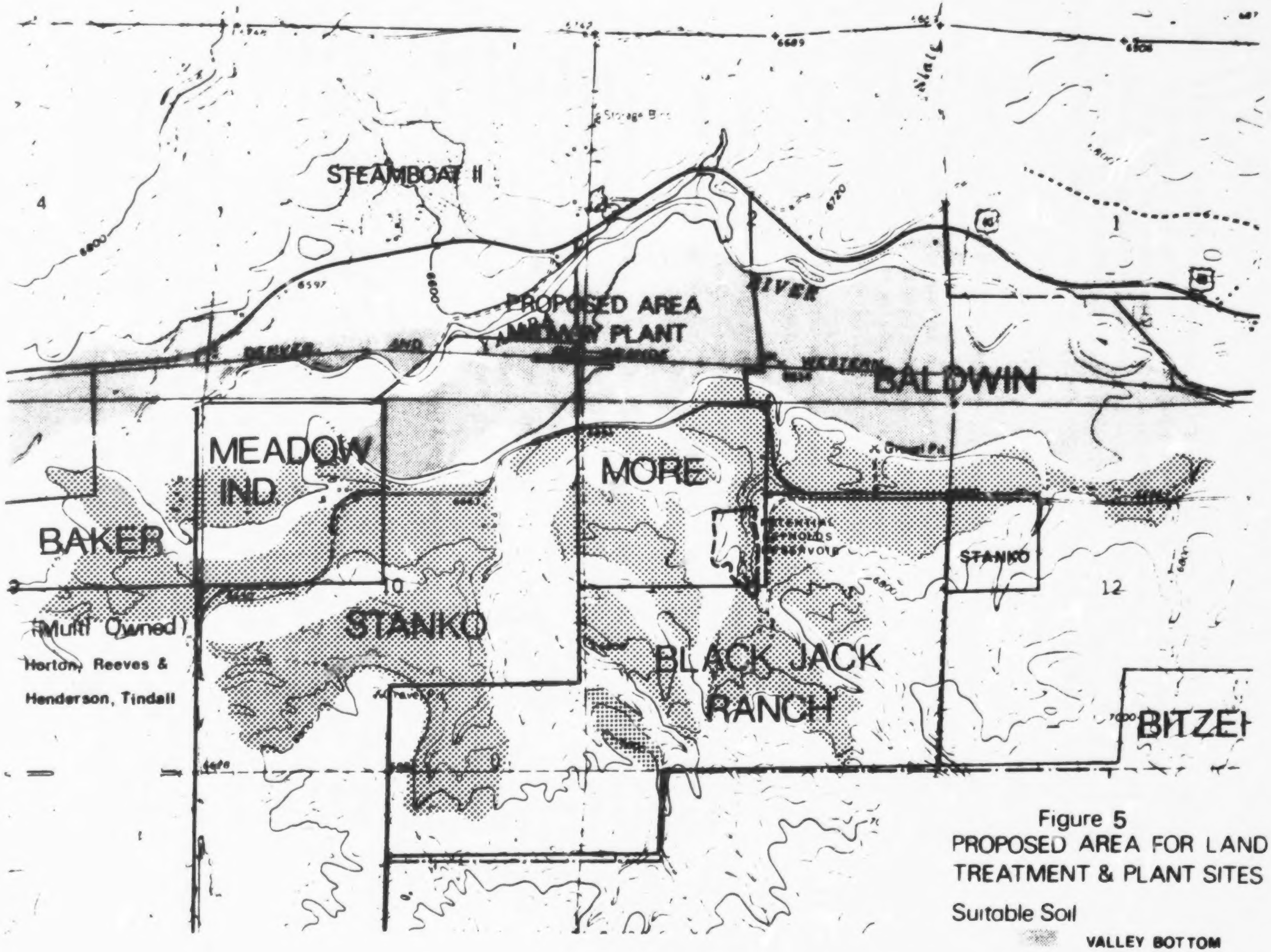
STEAMBOAT II
4
1
Storage Bins
6600
6597
6720
PROPOSED AREA
PLANT
RIVER
DENVER AND RIO GRANDE WESTERN
BALDWIN
MEADOW
IND
MORE
BAKER
Gravel Pit
POTENTIAL REYNOLDS RESERVOIR
STANKO
12
10
STANKO
(Multi Owned)
Horton, Reeves &
Henderson, Tindall
BLACK JACK
RANCH
BITZEI
Suitable Soil
VALLEY BOTTOM
UPPER TERRACE

Figure 5
PROPOSED AREA FOR LAND TREATMENT & PLANT SITES

the secondary effluent from the existing sewage operations, and it may receive portions of the tertiary effluent in future operations. The terrestrial environment is discussed because parts of it may receive secondary effluent, as part of a tertiary treatment scheme. The rare and endangered species are discussed because their continued existence could be threatened by the project and its growth ramifications.

Aquatic

The Yampa River is the major aquatic environment of the project area. Studies have shown its ecological health to be poor due to its chemical and physical conditions (Wright-McLaughlin Engineers, October 1975). This has resulted in poor growth of aquatic plants, insects and fish. An explanation for this situation is offered in the text that follows, organized according to physical conditions, plants, insects and fish.

The physical state of the river was analyzed by Dr. Robert Pennak in July 1975. He organized the Yampa River into three ecological units (Wright-McLaughlin Engineers, October 1975). The first area (I) extends from the south boundary of the study district to a point just short of Steamboat Springs. The second area (II) passes through Steamboat Springs, and the third area (III) extends from below the city to the district's west boundary.

The river banks throughout area I are characterized by irrigated grasslands or hayfields and are frequently grazed by cattle. When the activities of these cattle combine with the haying operations, natural streamside vegetation is removed and erosion results. This action causes the river bottom to be layered with organic silt or clay, and it reduces the biological potential of the river. Other components of the river's bottom are shown in Table XVI, and include boulders, rubble, gravel and sand-silt. The percentage of sand-silt is 27, which is several times greater than values from the other two areas.

Bank stability in area I is judged to be 61 percent by Dr. Pennak (Table XVI), which is less than the other two areas. This disparity is due to the greater bank erosion of area I. The average width of the river through area I is 96 feet. It's average pool depth is about three feet and its average riffle depth is about two feet. The pool depth is too shallow for proper trout habitat.

The length of the river through area I is about 13,200 feet, about 2.7 times longer than it would be if it assumed a straight-line course. The resultant meander would provide a good habitat for fish, except that the chemical and physical conditions preclude it from happening.

TABLE XVI

PHYSICAL CONDITIONS OF YAMPA RIVER[1]

Parameter	% Area I	% Area II	% Area III
Bottom Composition			
Boulder	12	14	17
Rubble	17	66	67
Gravel	44	14	11
Sand-Silt	27	6	5
Bank Stability			
Stable	61	96[2]	76
Unstable	39	4	24

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[1] Taken from the Steamboat Springs Wastewater Management Report, 201 Facilities Plan, Volume One. Wright-McLaughlin Engineers, Denver, Colorado, October, 1975.

[2] Artificial stabilization.

River conditions in area II are slightly poorer than in area I, due to encroachment from the city and stream channelization. Stream channelization has brought about a straighter channel and a more homogeneous stream bottom, both of which are poor for aquatic life. The river is often bordered by dikes, levees, railroad beds or streets and the pools and riffles are less well-defined than in area I. The natural trout population is small along this stretch although plantings by the Colorado Division of Wildlife are used to supplement it. These plantings may actually hinder the natural trout populations, however, since they must compete for scarce food with the introduced hatchery trout.

Conditions for trout improve downstream in area III. The river here has more meander than the straight-channel pattern of area II and its pools and riffles are deeper, longer and better defined. Humanly induced disturbances occur above and below the KOA campground, where channelization has straightened the river course, and near a gravel operation. Hay cutting and cattle grazing have also added their effects by removing native vegetation and fostering erosion.

The aquatic plants of the Yampa are generally contained in a film on the bottom called periphyton. This film contains not only plants but also bacteria, fungi, protozoans, tiny animals and the tissue from a multitude of dead organisms. This dead tissue usually makes up the majority of the film's substance and it is actively consumed by bacteria and other tiny organisms. The plants are generally one-celled organisms called algae or diatoms. A list of these organisms is shown in Tables XVII and XVIII. They account for the majority of plant production that occurs within the river's boundaries.

Table XVII shows a qualitative collection of these organisms, collected August 25, 1975 by the USGS at stations Y3 and Y8. Station Y3 is located at the USGS gaging station in Steamboat Springs (Study Map 1) and station Y8 is located about one and one-half miles upstream from the Elk River. The dominant plants found at the Steamboat station (Y3) are the diatoms Navicula and Nitzschia and the blue-green alga Lyngbya. The latter two are characteristic of the putrid zone of decomposition, which follows a discharge of sewage (US Dept. of Interior, 1966). The dominant plants at station Y8 are the green alga Stigeoclonium, the diatom Nitzschia and the blue-green alga Lyngbya; they, too, are found in the decomposition zone downstream from sewage discharges.

Other sites have also been sampled by the USGS and this information can be obtained by contacting Dennis Wentz at the USGS Office at the Denver Federal Center. Part of his information resulted from a collection that took place on September 5, 1975. Table XVIII combines this information with that from an earlier sampling (August 25, 1975) and gives an indication of the phytoplankton's biomass and productivity. The productivity is reflected in the plant's chlorophyll pigments a and b.

TABLE XVII

PERIPHYTON OF THE YAMPA RIVER

August 25, 1975[1]

Organism Name	Common Name	Station Y3	Station Y8
Chlorophyta	Green alga		
Chlorococcales			
Characiaceae			
Schroederia		p[2]	
Occystaceae			
Ankistrodesmus		p	p
Scenedesmaceae			
Scenedesmus		p	p
Oedogoniales			
Oedogoniaceae			
Oedogonium		p	
Ulotrichales			
Chaetophoraceae			
Stigeoclonium			D[3]
Chrysophyta			
Centrales	Diatom		
Coscinodiscaeae	Centric		
Cyclotella			p
Melospira		p	p
Pennales	Pennate		
Achnanthaceae			
Achnanthes		p	
Cocconeis		p	p
Cymbellaceae			
Cymbella		p	p
Epithemia		p	p
Diatomaceae			
Diatoma		p	p
Fragilariaceae			
Synedra			p
Gomphonemataceae			
Gomphonema		p	p
Naviculaceae			
Navicula		D	p
Nitzschiaceae			
Nitzschia		D	D
Tabellariaceae			
Tabellaria		p	
Heterosiphonales	Yellow green alga		
Vaucheriaceae			
Vaucheria			p
Cyanophyta	Blue-green alga		
Oscillatoriales	Filamentous		
Oscillatoriaceae			
Lyngbya		D	D
Oscillatoria			p
Chroococcales	Coccoid		
Chroococcaceae			
Agmenellum			p

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[1] Preliminary information collected by the USGS and subject to further scrutiny and verification.

[2] Present.

[3] Dominant.

TABLE XVIII

BIOMASS OF PERIPHYTON ON YAMPA RIVER

	September 5, 1975				August 25, 1975	
	Station Y1	Station Y2	Station Y4	Station Y5	Station A3	Station A6
Dry Biomass (g/m^2)	6.5	15.0	6.1	9.5	15.0	1.7
Ash Biomass (g/m^2)	4.6	12.0	4.2	6.1	3.5	1.2
Chlorophyll a (mg/m^2)	5.0	6.3	5.0	4.8	4.1	3.8
Chlorophyll b (mg/m^2)	0.8	0.6	0.6	0.4	0.1	0.3

These pigments take sunshine, carbon dioxide and water and make organic compounds and oxygen. Their combined density on September 5th varied from 6.9 mg/sq.m at station Y2 to 5.2 at station Y5; this lower density occurred just below the Steamboat Springs sewage outfall.

Associated with the phytoplankton are larger plants, rooted in the river's rocky bottom. They exist in small quantities and do not account for a significant percentage of the river's plant production. Additional plant material is incorporated into the river from terrestrial sources. Plants from this source could account for more production than is created by the periphyton or rooted aquatic plants. Nonetheless, the health of the river's own plants is essential if healthy trout populations are to be revived.

The insects of the Yampa are a primary source of food for the trout population; biologists call them benthic organisms. They feed on periphyton, organic matter suspended in the stream, and sometimes each other. They are comprised largely of two-winged flies and caddisflies although mayflies, beetles, mites and snails can also be found. The USGS verified this assessment on August 25, 1975 with a benthic survey at the same two sites sampled for periphyton. The results of their analysis are summarized in Table XIX, according to organism name, common name and density. The densities represent the numbers of organisms taken within three square feet at each station.

The station at the USGS gaging station (Y3) was dominated by two-winged flies although it received secondary contributions from caddisflies. The two-winged flies usually predominate in streams that have experienced high loads of organic silt. This situation is more pronounced upstream but is still significant enough to allow the dominance by flies. Further downstream at station Y8, caddisflies become the co-dominant bottom insects, along with two-winged flies. Caddisflies are indicative of cleaner waters so it can be suggested that the downstream station (Y8) is less polluted than the site in Steamboat Springs (Y3).

In addition to the types of organisms, their population numbers and their weight are also indicators of the river's health. The numbers found at station Y3 were 65 per square foot or 699 per square meter. Densities below 1000 organisms per square meter are considered a poor benthic population (Dr. R. Pennak, Wright-McLaughlin Engineers, October 1975), so the bottom insects along this stretch would not be expected to support high populations of reproducing trout. The downstream station (Y8) is slightly more productive and support 106.7 organisms per square foot or 1148 per square meter. This station would support a slightly larger trout population than Y3, but it would still have a relatively low carrying capacity for trout.

TABLE XIX

BENTHIC INVERTEBRATES OF THE YAMPA RIVER

August 25, 1975[1]

Organism Name	Common Name	Density (no./ft^2)	
		Station Y-64	Station Y-63
Hydracarina	Water mite	1.3	1.3
Coleoptera	Beetle		
Elmidae	Riffle beetle		
Optioservus		0.7	0
Zaitzevia		2.3	3.0
Diptera	Fly		
Chironomidae	Midge fly		
Microtendipes		5.3	4.7
Nanocladius		0	4.7
Orthocladius		16.3	9.0
Pentaneura		0	2.7
Phaenopsectra		6.0	0
Polypedilum		0	4.7
Tanytarsus		3.3	0
Rheotantarsus		0	13.7
Rhagionidae	Snipe fly		
Atherix		3.7	3.1
Simuliidae	Black fly	1.0	1.7
Ephemeroptera	Mayfly		
Baetidae			
Baetis		2.0	5.3
Ephemerella		1.0	2.7
Ephemeridae			
Tricorythodes		0.7	3.7
Heptageniidae		1.0	0
Plecoptera	Stonefly		
Pteronarcidae			
Pteronarcella		1.0	0
Perlodidae			
Arcynopteryx		0	0.7
Trichoptera	Caddisfly		
Helicopsychidae			
Helicopsyche		0.3	0
Hydropsychidae			
Cheumatopsyche		0	3.0
Hydropsyche		10.7	39.7
Arctopsyche		0	1.0
Hydroptilidae			
Leucotrichia		6.7	0.7
Ochrotrichia		0.3	1.3
Leptoceridae			
Athripsodes		0.3	0
Oecetis		0.7	0
Basommatophora			
Physidae	Pond snail	present	not present
Total Density (no./ft.^{2})		65.0	106.7
Wet Biomass (g/m^2)		3.56	4.37

[1] Preliminary data supplied by the USGS, which is subject to further scrutiny and verification.

Many factors of water quality affect the abundance and diversity of the benthic insects. Nutrients like phosphates and nitrates can increase their food supply and stimulate their growth. Other factors, like suspended solids, can clog their gills and smother their developing young. This action is most likely in ecological area I, just upstream from Steamboat Springs, where fine organic material and clay are layered on the bottom.

The most abundant fish in the study area is the mountain white fish, followed by rainbow trout (Table XX). The white fish is normally not considered a game fish although it has good eating and sporting qualities. Specimens weighing up to four pounds and measuring 28 inches in length have been reported. The rainbow trout are planted by the Colorado Division of Wildlife and normally attain lengths of from eight to fourteen inches. A natural population of rainbow trout also exists and competes for food with the transplants.

Other trout occur along this reach of the Yampa and they include brown and brook trout. Brook trout usually occur at the higher elevations and browns at the lower. Brown trout are the hardier of the two and grow to large sizes. A 17-inch brook trout was caught near the mouth of Soda Creek last summer.

Although none of the trout species presently fare well along this stretch of the Yampa, several other fish species are doing as well. These include the Colorado squawfish, bonytail chub, humpback chub and the humpback (razorback) sucker. In Colorado, these species are found only in drainages of the Colorado, Gunnison, Yampa and White Rivers. A recent survey by the Colorado Division of Wildlife showed a few Colorado squawfish in the lower Yampa. None of the others appeared in the Yampa River study areas although wildlife officers suspect some bonytail chubs may live below Craig, Colorado. The reason for the decline in these endangered species is stream channelization, bank erosion and the elimination of backwater swamps.

Terrestrial

The terrestrial areas of interest to this project are the riparian environment and the cultivated fields. The riparian environment is the streamside area that parallels the course of the Yampa River. It is of importance since facilities will be built on it or near it, and parts of it may be irrigated with secondary effluent. The cultivated fields may also be irrigated with this same effluent.

The vegetation of the riparian area is characterized by cottonwood trees and clusters of willow bushes. Often associated with the willows are sedge, grass-like plants that like a moist environment. Hay meadows are also present and are especially prominent in the stretch of river between Steamboat Springs and the west boundary of the study area.

TABLE XX

POPULATION STATUS OF FISH OF THE YAMPA RIVER

Scientific Name	Common Name	Population Status Abund.	Com.	Low	Scarce
Salmo gairdneri	Rainbow trout	x			
Salmo trutta	Brown trout		x		
Salmo clarki	Cutthroat trout			x	
Salvelinus fontinalis	Brook trout		x		
Prosopium williamsoni	Mountain white fish	x			
Phinichthus nubilis yarrawi	Speckled dace		x		
Castostomus catastonus	Western longnose sucker		x		
Cattus annae	Eagle sculpin				x
Xyrauchen texanus	[a] Humpback sucker				x
Gilia spp.	[a] Humpback chub				x
Gilia rabusta elegans	[a] Bonytail chub				x
Stychocheilus eucius	[a] Colorado river squawfish				x

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[a] Rare or endangered species

Their presence indicates the extensive human modification of this environment.

The animals of the riparian environment and the cultivated fields are largely small mammals and birds. All kinds of waterfowl use the riparian lands, including the endangered greater sand hill crane and the whooping crane. More common varieties include mallards, kingfishers and magpies. In the cultivated fields the common pocket gopher exerts its effects by burrowing shallow tunnels across the fields. Its impact, however, is superseded by that of domestic livestock.

Rare and Endangered Species

Several types of organisms have been designated as rare or endangered by the US Department of Interior. A rare species is one whose survival is threatened because of its low population numbers. When a rare species has even fewer numbers, and its survival is in immediate jeopardy, it becomes an endangered species. The rare species occurring near Steamboat Springs include Colorado cutthroat trout and prairie falcon. The endangered species include peregrine falcon, southern bald eagle, greater sand hill crane, whooping crane, wolverine, bonytail chub and Colorado squawfish. The sand hill cranes have a nesting area south of Steamboat Springs, and whooping cranes pass through the general area on their migratory pathway to the San Luis Valley.

Air Quality

In this section the importance of study area climatology is discussed, followed by a review of air quality. The odor potential of waste-water facilities is then discussed and related to interviews with local citizens.

Climatology

Steamboat Springs has a climate referred to as Highland Continental, characterized by low precipitation, large fluctuations in daily temperatures, low humidity, moderate amounts of wind and abundant sunshine. Summer days are warm but seldom hot; summer nights are cool. Winter nights are quite cold, particularly along the Valley bottom; however, the days are more comfortable because of low humidity and usual bright sunshine. The prevailing wind direction into the area is from the west. These winds arrive comparatively dry after their long travel over land and their moisture loss in passing over mountains. Relatively open areas to the north and northwest permit easy access for many storms from the north, compared to the more protected areas of western Colorado.

It is common in the winter to board the gondola at Mt. Werner in the morning with the temperatures around 10°F and arrive at the top in 25°F conditions. This is characteristic of temperature inversions that hold cold air near the ground with warm air aloft. These conditions are quite prevalent and intense in the Study Area. Figure 6 summarizes some inversion measurements taken near Hayden, 25 miles to the west. This data was recorded as part of the environmental assessment for that area's coal-fired power plant.

The average annual precipitation is about 30 inches along the mountains, just east of the Study Area, and 20 inches in Steamboat Springs. The City experiences unusually large annual rainfall for its elevation, attributable to the sharp rise in elevation directly to the east. Annual snowfall averages 165 inches and provides light powder conditions on numerous winter days. Heavy accumulations often make Mt. Werner a "powderhound's" delight following its periodic storms. Monthly variation in precipitation is shown in Figure 7, taken from 30 years of recorded data. Also shown is variation in monthly temperature averages. Wright-McLaughlin's "Volume One" compares these averages to daily maximums, which demonstrate that a large variation in daily temperatures affects the length of the growing season.

Land areas above 9000 feet have, on the average, have an annual growing season of about 50 days, with south-facing slopes considered possible exceptions (Gathers, 1973). The growing season is considered to increase by approximately two weeks for every 1000 feet in elevation below 9000 feet (Table XXI).

TABLE XXI

AREA GROWING SEASON

	Elevation	Growing Season (days)
	9000	50
	8000	65
	7000	80-90
	6000	100
Steamboat Springs	6700	
Proposed land treatment area	6600	

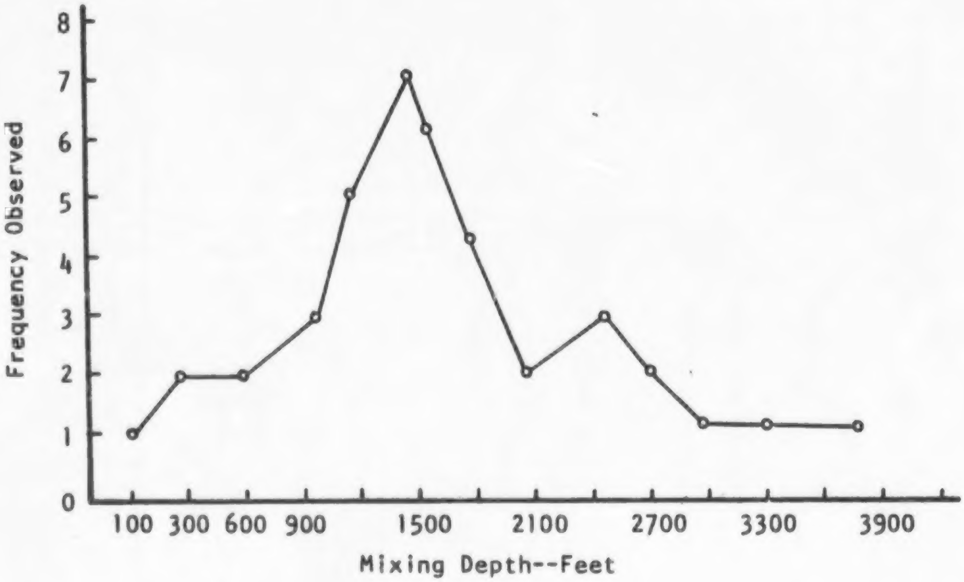
--Source: Gather, 1973

Stability

Frequency	Classification	Prevailing Wind Direction
50.5%	Stable (E,F)	E, ESE
15.1	Transition (B-C)	E
31.8	Neutral (D)	W
2.6	Unstable (A)	W

Mixing Depth (Inversion Height)

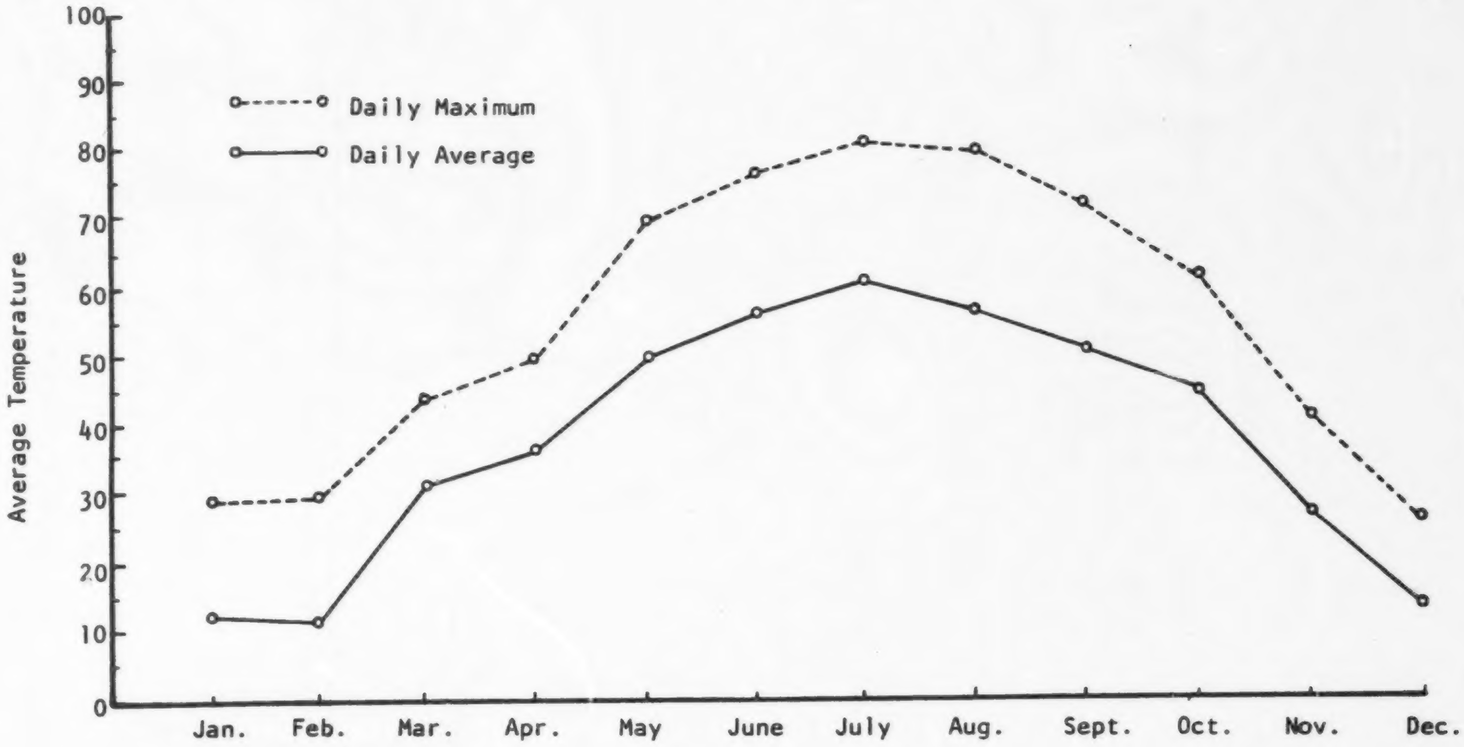
Average 1600 feet
Range 100-3800 feet



Hayden Meteorological Data

Figure 6

Source: Environmental Assessment, Yampa Valley Airport, Isbill Associates and Weiner & Associates, 1974.



Temperature Variations (Monthly Averages)

Figure 7

Severe frost at these higher elevations occurs between the end of August and the first week of June. As a result, little farming occurs above the 9000 foot level.

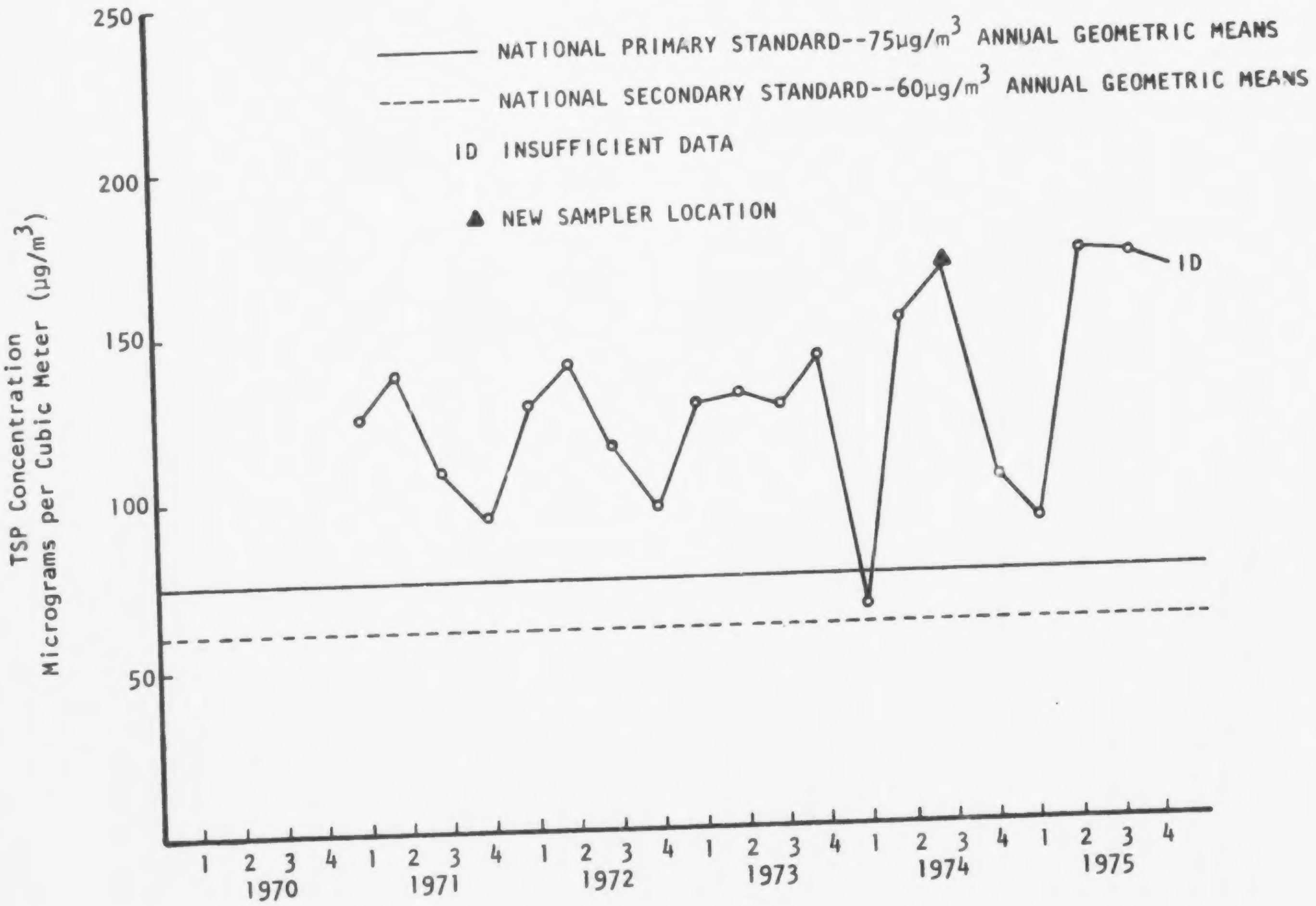
Review of the wind data indicates that during the morning, calm conditions prevail 65.6 percent of the time. Morning winds occur 15 percent from the northwest - southwest quadrants, with the remaining distributed among other quadrants. Afternoon conditions provide 43.2 percent calms and 35 percent westerlies. Windspeeds average 6 mph over the year although periodic high wind days have occurred, requiring the closing of ski lifts.

The significance of climatological statistics is that consideration must be given to growing season length, temperatures, humidity, rainfall, length of day and cloud cover, among other factors in designing a land treatment program. The most important fact remains that the candidate areas are presently irrigated so that problems in using effluent are limited to application rates, coverage areas and associated hydraulic loading. These factors constitute the principal engineering constraints for a land treatment system as discussed in the alternative analysis of this EIS.

Air Quality: In the following discussion the knowledge of ambient air quality in the study area is reviewed as is the applicability of State and Federal programs. The Bureau of Land Management has prepared an internal rough draft of the forthcoming "Draft Environmental Impact Statement for Coal Development in Northwest Colorado--Air Quality Section." Major topics of this draft include agency goals and model studies and is the only study available which considers the Steamboat Springs area.

The Yampa Valley lies within the Yampa Air Quality Control Region, currently priority 3 for the major pollutants of national concern. Such designation is meant to indicate that no Federal Primary or Secondary Air Quality Standards are being violated anywhere in the Region. However, it should be pointed out that this designation was arrived at on the basis of limited aerometric data. High-Volume (Hi-vol) suspended particulate and sulfasion plate data are the only regulatory agency measurements that have been taken in Routt County. Both of these measurements are limited in accuracy with sulfation plates providing only an indication of the presence of airborne sulfur compounds.

Figure 8 displays recorded levels of total suspended particulate (TSP) for the Steamboat Springs station. These measurements indicate almost continuous violation of State and National TSP ambient standards, which contradicts the above priority designation. There is no apparent seasonal trend, nor are there large industrial



Total Suspended Particulate (TSP), Steamboat Springs, Quarterly Geometric Means, 1971-1972

FIGURE 8

sources nearby that would explain these high levels. The concentrations recorded are characterized as among the "dirtiest" in the State by Colorado Health Department personnel. Although State officials express concern, this is considered a lower priority and therefore no agency action has been taken to identify or subsequently abate the source(s).

Fireplace Smoke at Ski Area Village

Pursuant to a court interpretation of Clean Air Act (1970 as amended), EPA and the State are currently preparing "Air Quality Maintenance Plans" for areas thought to be potential future violators of ambient standards. The impetus is to prevent deterioration of air quality in "clean" areas and to preserve maintenance of standards in other areas, where violations occur but compliance is expected. An anomaly exists in the case of Steamboat Springs where one of the highest ambient concentrations persists, while the area is not being considered for Maintenance Planning nor has its TSP priority classification been reconsidered. In the absence of point sources (industry, etc.) the cause of this obvious problem is likely a combination of road and field dust, becoming airborne by spring, and summer wind gusts and traffic. During the fall and winter, fireplaces and road sand are likely responsible. To accurately determine the source(s), TSP sampling in the area must become more sophisticated. In addition to knowing the mass-density (ug/m^3), the particle size and chemical composition must also be determined in order to develop any practical control program. This would be particularly valuable in assessing the air quality influence of the planned U. S. 40 bypass.

Adding even more importance to this need is the State ambient standards, which have been redrafted to address "significant deterioration." This seemingly complex topic is related to Maintenance Planning and attempts to define how much the air quality in pristine areas can be degraded by growth and development. The significance of all the preceding discussion is that agency planning and regulations are becoming more and more complex but until the true nature of the source-effect relationship is known for TSP, little success can be realistically anticipated from these endeavors.

In the absence of measured pollutant concentrations, researchers use mathematical simulation techniques. These techniques, referred to as diffusion models, combine emission estimates with historical meteorological data to predict ambient conditions. The principal air quality studies that have been done in the area include the environmental assessments and impact statements for power plant development near Hayden and Craig,* expansion of Yampa Valley Airport (Hayden), and the rough draft BLM-EIS for coal development in northwest Colorado. Both the power plant and airport studies dealt with their project areas and do not apply to this 201 Study Area.

The BLM effort thus far has produced a 2600-page study of northwestern Colorado. The air quality portion was required to look at all possible emission sources and to determine the coal-related growth impacts on air quality as well. The BLM consultant used a diffusion model for the Steamboat Springs area which is not considered valid. The model used (Gaussian multi-point and line sources) is not applicable for mountain valleys due to the effects of the terrain. Even though the validity of the predicted concentrations seems questionable,the following conclusion seems justified:

> "Air quality during the proposed development would be degraded in terms of all presently regulated pollutants: suspended particulates, sulfur dioxide, carbon monoxide, nitrogen oxides, reactive hydrocarbons and total oxidant. Although emissions controls are proposed at the power plants and mines and vehicular emissions are regulated, adverse environmental effects could not be avoided."

This preliminary Statement goes on to conclude that Federal TSP standards will be exceeded in Steamboat Springs as already is the case. It also states, "power plant emission of fine particulates and conversion of sulfur and nitrogen oxides to aerosols would cause a visibility reduction that cannot be mitigated." Elsewhere in the report, BLM states that the visibility range in the region is 90-100 km, while Steamboat Springs has an average visibility limited to 10-20km.

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* Some field monitoring of SO_2 has been done to calibrate the diffusion model used.

As the temporary and permanent population grows, more road sand dust and fireplace smoke will be emitted to the air in the Study Area. When this is considered in conjunction with power plant aerosols, predominant westerly winds, intense winter inversions, reduced visibility in the area, and the continued violation of TSP standards, serious concern must be raised for the study area's air quality.

The TSP sampler is now located on the County Court House along Lincoln Avenue, U.S. 40 through the City. The high levels are obviously influenced by the heavy traffic volumes on Lincoln Avenue which help the excessive street dirt and sand to become airborne. An adequate urban runoff control program would not only benefit the Yampa but also likely improve TSP ambient conditions through routine street cleaning.

Odor

Wastewater treatment facilities affect air quality primarily in the area of ambient odor and its impact on nearby citizens. When treatment works are proposed in new locations, odor potential often stimulates local emotions and public interest surges. The small sewage plants at Steamboat II, Bear Pole Ranch, Sleepy Bear and KOA experience problems characteristic of plants of their size, not the least of which is odor. No odor complaints have been recorded for the Mt. Werner plant which is located well away from nearby residences.

The Steamboat Springs Sewage plant is located immediately adjacent to residences and businesses to the west and north. During the last week of February, the closest residents to this plant were interviewed. The families interviewed have lived in the nearby mobile home park from one to four years. No one contacted objected to the presence of the existing plant or a new plant. In fact, two residents were not even aware of the existing facilities location. Occasionally, 86 percent of the respondents detected an odor which they attributed to the plant; however, no one felt it was objectionable enough to merit a complaint.

Because this system is similar to Mt. Werner, it is dependent on blowers to keep the system aerobic. One resident stated that a power outage had created an objectionable odor. That same person's main concern was over the visibility of a new plant if located at the existing site. It is feared that a new building would block a direct view of Mt. Werner, which is the principal aesthetic amenity to these residents. Thus, building height and visibility are principal concerns of nearby residents, followed by a general desire to be assured that a new plant, handling more and more flow, will be no more objectionable than the present facility.

History and Archaeology

In 1875, James Crawford was so anxious to secure the claim he had staked in the lush Yampa Valley that he started out before the snow melted and skied to the site of Steamboat Springs. By the end of that summer his family was one of five that had cabins in the area and Crawford had become the father of the town.

The pioneers were preceded by trappers and prospectors. The trappers thought the springs sounded like a paddle wheel steamboat, so the story goes, and are responsible for the present name. The Ute Indians called the area Medicine Springs and had for several centuries used it as a pleasant, cool summer hunting grounds.

After a small uprising in 1879 the Utes in northwestern Colorado were removed south to the Ute Reservations and white families felt safer about coming to Steamboat to settle. Mail service had been instituted in 1878; in 1883 a school and a sawmill, which made planked buildings possible, were founded.

In 1884, Crawford and some other investors formed a company to promote the town and sell lots. Later in Steamboat's history other entrepreneurs turned to real estate, particularly after 1890 as small family ranches became the mode.

The town grew steadily until by 1900, the year it incorporated, it had a population of around 900. The collapse of the gold mining boom at Hahn's Peak, 20 miles to the north, created, as elsewhere in Colorado, a lot of new farmers and ranchers. And the extension of the Denver and Rio Grande railroad to Wolcott, 80 miles to the south and a day and a half by stagecoach, brought the town within ordinary reach of previously extravagant amenities.

By 1902 Steamboat Springs had a lively commercial life with dozens of stores, a public library, electricity and telephone service. A water and sewage system did not come until 1904.

The long-awaited coming of the railroad to Steamboat itself happened in 1908. It was mainly a boon to the cattle industry and for a short time more cattle were shipped from Steamboat Springs than any other single point in the country.

People expected the railroad to be the missing link in a number of other industries: mining of coal, oil and other minerals, timber and tourists. But mining never developed as extensively as predicted, logs either raced too fast down the Yampa or jammed at low water, and despite the construction of a 100-room hotel and huge swimming pools, the town never developed into a spa.

Strawberries did, however, boom for several years around that time. Because a single farmer converted six acres into a profit of $3000 one year, the entire valley of Strawberry Park was planted with strawberries. The berries, grown at high altitudes, came to market later than other commercial crops and some went as far as Chicago. But three years of early frosts ruined land speculators and farmers, and the idea died.

Meanwhile, an everyday winter activity had taken a new, festive turn which was to mature a half century later into another boom. Homemade skis, furbottomed to prevent backsliding, were a necessity in early Steamboat for people like mail carriers, ranchers and pallbearers. Then, in 1914, a Norwegian named Howelson set up a hill on his property as a ski jump and convinced his neighbors that what they had was fun. The first ski carnival was held later that year and consisted of a jumping event and a cross country race.

Steamboat Springs continued down through the years as a mildly prosperous town of steady balues and relatively little change. For nearly 50 years the town's population hovered between 1,000 to 2,000. Its location on Highway 40 near Rabbit Ears Pass brought it some tourism, and the Olympic skills of Buddy Werner some fame, but for the most part it remained isolated in its corner of the state. Then came the development of Mt. Werner and all was to change.

Archaeology

According to the state archaeologists there are two archaeological sites within the study area. Both are located southwest of Mt. Werner and south of the Mt. Werner sewage lagoon in the neighborhood of the Yampa River and U.S. 40. Neither archaeological site is close to any of the areas under consideration as a site for sewer facilities. However, the state notes that its files are incomplete. As a result, should any archaeological artifacts be unearthed, construction should be halted until they can be evaluated by an expert authority.

Population

Steamboat Springs has undergone incredible growth and change within a short time. Once a quiet, rural town where ranching, lumbering and some mining and tourism were the chief endeavors, it is now the home of one of the nation's best known ski resorts.

The resulting influx of people has brought enormous problems. Living costs have skyrocketed; roads are overcrowded; other public utilities are strained to the limit; and agricultural traditions are threatened. These issues are discussed in succeeding chapters on land use and socioeconomics, but in this section we shall deal with the root problem of population growth.

Like that of many resort communities, the population of Steamboat Springs is difficult to tally. A steady stream of tourists, skiers and part-time residents complicates any population count. There are of course full-time residents who live and work in the area year-round, but even a calculation of their numbers is confused by the rapid growth which occurred between 1970 and 1973. The U.S. Census figures, taken in 1970, were outdated not long after their release. Other traditional government sources are of little or no use. The Northwest (Colorado) Council of Governments lacks population data of its own for either Routt County or Steamboat Springs. The State Planning Office which has estimates of present and future population for the county does not separate figures for Steamboat Springs, nor does the federal Office of Business and Economic Research.

Fortunately, several studies containing population data were completed by private consultants at the request of local government; and one federal agency, the Bureau of Land Management, developed population data as part of an environmental impact statement for coal leases. However, each of these studies is based on work completed by Charles Gathers and Associates as part of the Comprehensive Plan commissioned by the County. It is for this reason that our analysis will focus on Gathers' estimates for the Steamboat Springs area, and will discuss other surveys only as they relate to these estimates.

The Gathers Report: In order to obtain estimates of existing population, Gathers analyzed the two main economic bases of the Steamboat population: the sector of the economy which serves the agricultural community and that related to the skiing industry.* An estimate of 1973 agriculture-related employment and population was derived from interviews, housing surveys, and an analysis of Census data, which applies somewhat to ranching since this was not the sector in which rapid growth occurred. An appraisal of 1973 ski (or tourism) related population was also obtained from interviews and housing surveys, along with assumptions about labor participation rates and population density in skier-oriented economies.

Together, Gathers estimated the 1973 population of the Steamboat Springs area to be as follows:

Permanent	4,917
Temporary (Lodging unit capacity)	5,406
Total Peak Day Population	10,323

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* Mining, which could affect population if new coal leases are granted, is discussed later in this chapter.

From these figures Gathers derived population projections through 1995. The following methodology and assumptions were used:

- All increases in tourist-oriented population would derive from an increase in daily lift capacity (DLC) at Mt. Werner. Gathers assumes that DLC would increase from 6,000 in 1973 to 12,000 by 1979.
- After DLC increased, there would be a three-year lag time in lodging capacity expansion to meet the needs of the increased numbers of temporary residents drawn to Steamboat as a result of increased skiing facilities.
- The existing relationship between lodging capacity and tourist-related employment was projected to remain the same, as was the labor participation rate (ratio between employed persons and total population).
- Agriculture-related population would remain relatively static, but would tend to decrease as recreation-oriented population increases. Labor participation rates and population density would remain static within this sector of the economy.
- A 10 percent increment was added to the figures for each economic sector as a "safety factor." This increment was intended to compensate for any other inducements to growth which could not be predicted at the time of the study, the most likely of which is increased mining activity.

From the above, Gathers projected the 1995 population of the Steamboat Springs area to be 23,600 on peak days, broken down into 9,900 permanent residents and 13,700 transients.

Analysis of Method and Assumptions: The method used by Gathers is sound. However, the assumptions were made when Steamboat was at the tail end of a tremendous economic boom, and are overly optimistic.

Using the wisdom of hindsight, we believe that the Gathers estimates of present population are too high. Interviews with people in the Steamboat community indicate a sharp cutback in the area's growth over the last two years. Construction has fallen off due to overbuilding which has left a surplus of tourist-oriented housing. In addition, a lack of jobs (other than seasonal), a shortage of affordable resident housing, and a high cost of living persist, all of which have deterred new additions to the permanent population. For this reason we have concluded that the Gathers estimate of 1973 permanent population more appropriately applies to 1975.

We also feel that Gathers overestimated both the future rate of growth and the ultimate population of the Steamboat area by 1995. We have therefore developed alternative projections based on Gathers' model, but with different assumptions relating to DLC, government approval to expand DLC, lag time between DLC expansion and housing construction, the national economy, the definition of peak population, and the influence of coal development.

Daily Lift Capacity (DLC): The capability of a ski area to transport skiers up the mountain and distribute them among the slopes is a critical parameter in Gathers' methodology. It is also a fundamental factor in ski area planning and management. For this reason many equations have been derived by the Forest Service and others to consider the physical characteristics of the mountain as well as the facilities placement. These equations and specific interviews suggest present DLC at the Steamboat Ski Area ranging from 6,000 to 7,850 skiers. The best estimate in our opinion and that of area personnel is 6,600 skiers for the existing facilities (Barrows, 1976).

We believe that the DLC will expand to 8,000 by 1984, to 10,000 by 1991 and to 11,000 (maximum)by 1995, compared with Gathers projection that it will be 12,000 by 1979. Representatives of LTV have indicated that their most optimistic plans would include a minimal expansion of DLC by 5,000 by 1982 or 1983 at a new base site. One point of uncertainty is that LTV might sell its interest in the ski area. Should this occur, it is not possible to predict its exact effect on plans for possible ski area expansion. For this reason we have taken the physical potential of surrounding terrain, management statements, local and regional Forest Service projections and County planning staff opinions into account in arriving at a maximum of 11,000 skiers.

Government Approval: Any expansion of the dimensions discussed above, whether by LTV or new ownership, would require the approval of several agencies, including the U.S. Forest Service, the Routt County Regional Planning Commission, and the Routt County Board of Commissioners. Expansion could ultimately be accomplished; however, there would be several obstacles and time delays. Representatives of the Forest Service have recently initiated work on an area-wide Environmental Impact Statement for their Program Unit Plan for the Routt National Forest. It will take approximately five years to complete this study, and Forest Service personnel have stated that until this process is completed, no new ski area expansion will be approved. It is also possible that a separate EIS will be required for individual ski area expansions, depending on the nature of the proposed development. It is for these reasons that we have used the later lift capacity expansion dates.

More importantly, the County Commissioners are faced with the substantial burden of meeting the needs of an expanding population. They advocate that growth rates be slowed to allow the County and the City to "catch up" with the needs of their constituents. They are certain to take a hard look at proposed ski development expansion in order that they might be better able to successfully accomodate its impact on the County. While it is likely that such development will ultimately be approved, it is our opinion that the County Commission's scrutiny of any proposal will tend to prolong the time needed to obtain final approval for lift expansions.

Housing Development: We have also assumed that there will be a lag time of five years between expansion of DLC and construction of increased lodging. This assumption was made for two reasons. First, there has already been substantial overbuilding of temporary lodging. Even at peak periods (the 30 best days of the ski season), temporary lodging is only 60% of capacity. We feel that until this ratio approaches 75% or more, there will not be extensive new tourist housing construction. Second, there has been a considerable slowdown in the construction industry throughout the country. Money markets are tighter and financing is more difficult. Should there be extensive energy development in or near Routt County, housing construction will turn towards the needs of energy workers and will stretch the lag time for ski-oriented construction beyond the three years projected by Gathers.

The National Economy: There are some industries which seem almost immune to fluctuations in the national economy. Tourism, particularly skiing, has recently seemed to be a good example of just such a phenomenon. In the past few years, as the nation has been experiencing a relatively serious recession, overall numbers of visitors to ski areas have continued to increase. Although skiing has increased in the midst of a recession, it would be oversimplistic to assume that ski areas are unaffected by a downturn in the economy.

While tourism is apparently unaffected, construction of ski area facilities and second home development have become particularly susceptible to national economic trends. In a time when national money markets are tight, speculators and developers are much more cautious about such capital intensive investments. While families may continue to indulge in an annual ski vacation, they will be much more likely to rent a condominium than to consider the purchase of a permanent second home.

Even with eventual national economic recovery, the ramifications of overbuilding will continue to be a concern. The almost tragic overdevelopment which now threatens neighboring Summit County (The Denver Post, 2/15/76, p. 1E) and the now defunct Stagecoach and Steamboat Lake developments in Routt County, graphically present a warning which will undoubtedly be heeded by developers in the future. Money markets will likely assume a similar conservative posture toward these speculative ventures. The effect will probably be a return to classical economic attitudes where supply will follow well documented demand as opposed to speculation that supply itself stimulates demand, hence growth.

All of these factors contribute to the anticipation of a slower rate of ski area development and housing construction than has been projected by Gathers as shown in Figure 9.

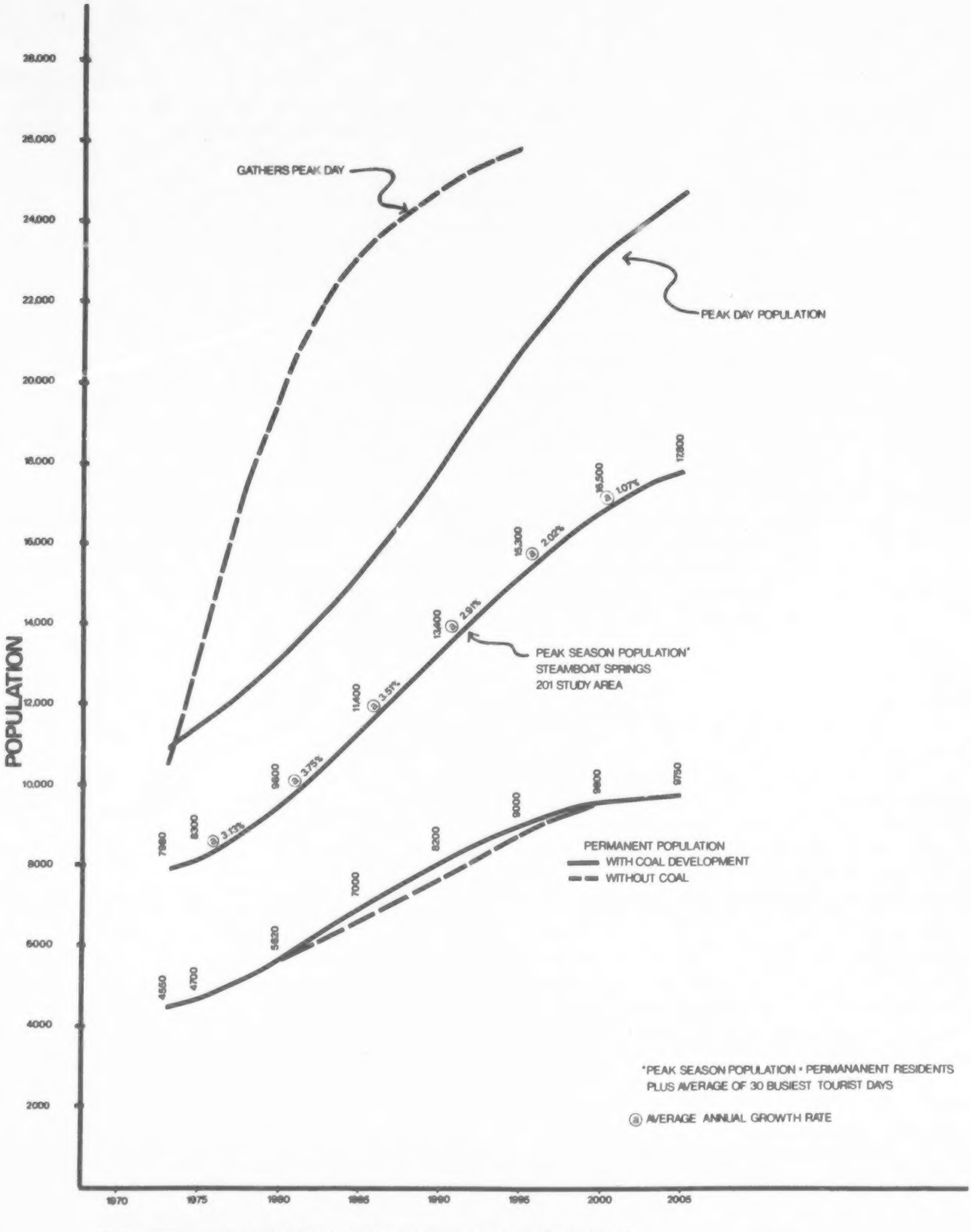
Peak Population: We have made one further modification of the Gathers data which we feel more clearly represents the actual situation in Steamboat. "Peak-season population" refers to the total permanent population plus an average of the 30 busiest tourist days of the ski season (as opposed to December 28, when every pillow in the study area probably has a head on it). This 30-day average presently corresponds to 60 percent of the total tourist accomodations, and as such, is a more representative and realistic accounting of the seasonal population. A peak day projection is also shown which correlates with sewage flow data and is thus being used by Wright-McLaughlin for design purposes.

The Influence of Coal Development: It is fairly evident now that there will be some increase in local Steamboat Springs population resulting from the development of extensive coal deposits in Routt and Moffat Counties. This fact was less evident when Gathers was doing the research for the Comprehensive Study in 1973. However, this 10 percent "safety figure" did take into account the expected, but then undefined, stimuli to growth in the area. These stimuli, independent of tourism and ranching activities, could include construction of Bureau of Reclamation dams and the expansion of the Hayden power plant, or they could include the increase in population resulting from increased coal development.

Our second permanent population curve includes growth anticipated as a result of coal development in the Routt-Moffat County area. This added population was derived by subtracting Gathers' 10 percent "safety figure," then adding population estimates for the Steamboat area which were developed by the Bureau of Land Management in its draft EIS for coal development in the area.

While we feel that the total population resulting from coal development is accurately calculated by BLM, again we feel the schedule of development is over-optimistic. We have therefore calculated into the early development BLM figures a five-year lag time. This takes into acount the time necessary to litigate (environmentally-related) lawsuits, which may be filed as a result of potential coal leasing. As the population curves indicate, with coal development, growth in permanent population will be accelerated between 1980 and 1990, but will decrease substantially after 1990.

Staff members of BLM stated in the fall of 1975 that there would be an almost direct tradeoff between coal and recreation development. Although BLM is currently less certain about this statement, we feel that should



*PEAK SEASON POPULATION = PERMANANENT RESIDENTS PLUS AVERAGE OF 30 BUSIEST TOURIST DAYS

ⓐ AVERAGE ANNUAL GROWTH RATE

STEAMBOAT SPRINGS REGIONAL SERVICE AUTHORITY
201 STUDY AREA POPULATION PROJECTION

Figure 9

☆U.S. GOVERNMENT PRINTING OFFICE: 1976—678-153

there be an increase in permanent residents in Steamboat as a result of coal development, there will be a corresponding decrease in the number of temporary residents. As a result, the peak population will remain virtually the same, with or without coal development. This is because factors which contribute to population growth are seldom additive. An increase in energy-related population will be reflected in many sectors of the economy. The housing market will shift from the construction of condominiums at the base of the ski area to mobile or modular home development elsewhere in the county; retail services will provide more hardware, less ski equipment; restaurants will attempt to project more of a "family" image than they would otherwise; the planned nightclub would be replaced by a bowling alley. As Steamboat shifted to accommodate permanent energy-related population, it would expend less energy attracting the temporary, ski-oriented population and would, as a result, be less attractive to that segment of the population.

The overall effect would be to decrease the number of temporary residents in the Steamboat area--a number closely related to the number of permanent energy-related residents. It is for this reason that temporary and permanent population show fluctuations as a result of energy development, while overall peak population does not.

Land Use

Most land in Routt County and greater Steamboat Springs is agricultural. Figures from Gathers and Associates show that 73.2 percent of the county's square mileage is used for agriculture: 62.8 percent is range land, 6.7 percent is non-irrigated farmland, and 3.8 percent is irrigated farmland. Within the greater Steamboat Springs area, defined by Gathers as a border about five miles beyond the city, 29.2 percent of the property is agricultural, the largest percentage among all categories of use (Study Map 2).

Agriculture in Routt County and greater Steamboat chiefly involves the production of livestock, wheat, and other related activities. County farm receipts in 1975 came to $22,800,000, according to a report in The Steamboat Pilot, compared with $21,362,000 for the previous year. This was a six percent rise, as against a five percent increase for the state as a whole.

After agriculture, land use between the county and Steamboat Springs differs somewhat. For the county, commercial woodland occupies 20.9 percent of the square mileage, recreation areas 3.2 percent and subdivided land (outside of urban areas), highways, railways, airports, strip mines, water bodies and urban areas less than one percent each (Gathers and Associates, 1973).

In greater Steamboat Springs, public and semipublic lands, primarily the ski slopes on Mt. Werner, comprise 29.1 percent of the total acreage; vacant land, 23.3 percent; transportation, 8.6 percent; residences, 7.7 percent; and commerce and industry, 2.0 percent. The big percentages in Steamboat for skiing, transportation and homes reflect the town's dependence on recreation, which now dominates the local economy.

This was not always the case as mining, lumbering and ranching were the region's traditional endeavors. Some tourism existed, but due to the rugged terrain and the town's distance from any densely-populated area this was not a major source of income. Recreation, especially skiing, was a popular pastime, but did not provide much employment. A small ski run and jump on Howelson Hill, and a weekend area, built and owned by local residents on Mt. Werner, were all Steamboat had to offer until 1969. In that year, LTV Recreation Development Inc. purchased the Mt. Werner area and set off the expansion that would dramatically alter the locale's environment, economy and land use.

Other land developers followed LTV. Steamboat Lake, Stagecoach, Steamboat II, Tree Haus and Riverside were set up within a few years, shifting the economic base to real estate and recreational development. In each of the years between 1970 and 1973 land values skyrocketed as 593 dwelling units were constructed, 61 percent of them in the Steamboat Springs area.

City of Steamboat Springs

Ski Area Village

The selection of Steamboat Springs as a site for the 1976 Olympics inflamed the situation. As one report noted: "The overall mood of the county is one of great boom and anticipation" (HWH Associates, 1972).

The downturn in the national economy, the rejection of the Olympics by Colorado voters, and the bankruptcies at Steamboat Lake and Stagecoach put an end to the boom. For the last couple of years land sales have been in the doldrums. Still, as noted previously, no one doubts that significant growth will occur over the next 30 years, though at a decidedly slower pace. There will probably never be another period of growth like the years 1970-73, but the pressure to develop, to turn ranchland into commercial real estate will continue. An article in the November 13, 1975 Steamboat Pilot ("The Prospector," p. 6) noted that "recreational and land sales throughout the nation are beginning to pick up." It is only a matter of time before Colorado sales follow the national trend, despite the memories of Steamboat Lake and Stagecoach. LTV's advertising, the national attention gained by association with the Olympics, combined with the area's natural beauty, climate and other amenities, will keep Steamboat Springs' reputation as an attractive place in which to vacation or live.

A typical result of all the foregoing activity has been the institution of zoning regulations, for until 1972 neither Routt County nor Steamboat Springs had zoning. But urban development created an awareness that what an individual does with his property can affect neighbors and people who live miles away. The citizens of Routt County have been especially affected by financial setbacks at Steamboat Lake and Stagecoach. Certain other projects, especially road improvements, are something the area needs urgently but have been cut back due to the loss of expected revenues. Dr. J.A. Utterback, County Commission Chairman, notes, in the November 13, 1975 Steamboat Pilot (p. 1) that: "If the tax dollars we project don't come in, then we have to curtail a certain amount of the services we anticipated providing."

Because of growth-related problems, planning mechanisms in the county and Steamboat Springs were developed quickly. With help from Charles Gathers and Associates, the area soon had:

- established county zoning regulations;
- set up a management system to administer county planning activities;
- revised county subdivision regulations;
- established or revised zoning and subdivision regulations for Steamboat Springs;
- initiated drafting of a comprehensive plan for the county and its communities;

- planning commissions established for incorporated towns including Steamboat Springs;

Developers in Routt County no longer can act without lengthy consultation from public officials and the citizen-at-large. For example, county subdivision regulations require the completion of four steps before final approval can be given. First, an information presentation must be made to the Routt County Regional Planning Commission. This is followed by the Sketch Plan, consisting of basic design, maps of the area, reports concerning water and sewer systems, and additional information deemed necessary by the commission. If Sketch Plan approval is received, data for the Preliminary Plan is then required. This is the most costly and time consuming step, for it is at this point that specific design standards must be met. Detailed information is required with regard to geology and vegetation, slope analysis, roads and streets and protective covenants. It is also at this stage that state agencies are notified. If all goes well, the Final Plat, the last step in the procedure, should be the simplest of all. The Final Plat is the permanent and accurate record of the exact size, shape and location of lots, blocks, streets, easements and other parcels of land within the subdivision. During all stages, except the first, informal presentation, adjacent landowners are notified that the proposed development will be considered by the planning commission.

The existence of this public apparatus is by itself a discouragement to some growth. The death of the Olympics also relieved much of the pressure to develop and the boom years left the area overbuilt and overzoned. Already platted lands could easily hold projected population levels. Land use trends in the foreseeable future should, therefore, follow the pattern that has been laid out by planners. The county should be able to maintain its unofficial policy of contiguous development by allowing new construction only on property adjoining previously developed land. This, hopefully, will avoid some of the problems associated with satellite developments such as Steamboat Lake and Stagecoach, which were miles from the Steamboat Springs urban area, and will help in preserving agricultural land.

New populations will probably fill in and connect the area between Mt. Werner and the old town. This is the logical growth pattern and is in accordance with planning projections (Study Map 2). Whatever commercial and industrial development occurs should be in West Steamboat and southeast of town along Highway 40. This development is the logical pattern and in conformity with the land use plan.

However, some words of caution are in order. A number of questions remain about areas that have already been developed, but are a distance away from other developed zones. These areas include Steamboat II, Elk River and Deer Mountain estates. Most of the property between these

City Lagoons Border Trainer Court

Steamboat II Development

areas and the Steamboat Springs/Mt. Werner core is open land, and is zoned to remain that way. While there is no pressure in the immediate future to change that zoning, and while soil and related considerations act somewhat as a deterrent, the natural tendency over the long run may be to connect the clusters. The question of whether Elk River and Deer Mountain should be served by interceptor lines to the new sewage facilities is directly related to this issue.

Much of what happens will depend on the political and economic climates, neither of which can be predicted with certainty. The county Comprehensive Plan has not yet been formally adopted and even then is subject to changes. In addition, the unofficial contiguous development policy is the result of State Health Department policy which in effect prevents new point source discharges into the Yampa River because all wasteload allocations are currently filled. As a result, new developments must hook into existing sewage facilities, which makes contiguous development a necessity as well as a sound policy.

Socioeconomics

In Steamboat Springs, when you see someone wearing a cowboy hat, there is a reasonable chance he is a cowboy. The existence of ranching gives the town an authentic western atmosphere, the upkeep of which is very important. It is the area's most unique quality, the characteristic that separates it from the jet-set atmosphere of other resorts.

The local citizenry is aware of this. A significant amount of talk is about how to maintain the locale's traditions while reaping the benefits of the ski boom. In that sense, Steamboat Springs is not unique. Other resort towns have faced the same problem. The difference is that Steamboat Springs is still in a position to succeed where others have already failed.

Agriculture remains an important part of the local economy. According to 1974 figures from the Colorado Division of Commerce and Development, 13.8 percent of the local labor force was employed in agriculture, placing it third among eleven categories listed. Only "retail trade" with 19.7 percent and "services and miscellaneous" with 18.5 percent were ahead of it.

Besides ranchers, the community is comprised of the following groups:

- Land developers, who have seen a boom economy go bust. The area is now overbuilt with condominiums and development has slowed considerably. Much of the downturn was caused by events well beyond the control of individuals. The national economic conditions did not help; and few could have predicted that Colorado's voters would reject the Olympics, a circumstance that caused special pain since the area was considered a site for cross-country and ski-jumping events.

- The professional/mercantile establishment, including innkeepers, restaurateurs, lawyers, retailers and providers of various other services. Despite the crimp in the condominium market, the tourists and skiers continue to come, allowing this group to thrive and prosper. Skier days at Mt. Werner increased from 244,619 in 1972-73 to 437,447 in 1974-75. LTV, the corporation which owns the ski concession, anticipates a total in the neighborhood of 500,000 in 1975-76. Gross retail sales for Steamboat Springs rose from $9,978,060 in 1965 to $22,651,097 by 1974. Well organized commercial groups like the Chamber-Resort Association and the Restaurant Association thrive in this city and exert an important influence on its government.

- Transients, in their 20s and 30s, who come for the skiing and other amenities. Often staying only a winter or two, they account for much of the workforce at the ski area and in downtown sections. They are generally willing to accept low wages in return for a lifestyle that leaves plenty of time for recreation. Many live communally, unable to afford the area's expensive housing. However, their lifestyle is a form of voluntary poverty since most possess skills to move elsewhere and find well-paid jobs. Interviews with local residents indicate that fewer transients are arriving now than two or three years ago.

- The permanent workforce, which includes many former transients who liked the area and stayed. Other members of this group are government employees, teachers and some miners and construction workers. Competing for jobs with transients, while struggling to raise a family against inflated living costs, many fail to make it and leave after a few years. In fact, a majority of Steamboat Springs' residents (58 percent) have lived there for three years or less, according to Colorado Division of Highways study.

- Tourists, on whom many of the townspeople depend for their livelihood. Steamboat Springs was recently rated very high in courtesy and friendliness by a 3M National Advertising travel study, and there is little doubt that the area offers a special charm, particularly to city visitors. While gearing up the economy, the influx of tourists, especially ski vacationers, is also the reason for the high cost of land and housing, and for the pressure to convert agricultural property to commercial or residential use. Christmas is the busiest time of the ski season often supporting 10,000 to 12,000 people. This surge is partly due to the many students returning home with friends to spend the holidays. Local residents have many guests during this time, and many locals move in with friends and rent their own homes to tourists.

Senior Citizens: Persons over 65 years old comprise an above-average part of the population, 9.7 percent in Routt County compared to 8.5 percent for the rest of the state. Among the programs for retired people in Steamboat Springs are:

- Meals on Wheels, which expanded this past year, delivering an average of six meals per day compared to only one or two in previous years;
- The Retired Runabouts, a group of 25 to 30 regular members who themselves pay for most of their trips and expenses, though some funding comes through Routt County Senior Services;
- The Kiwanis Club bus, which once a week drives senior citizens to the main business district. Operated for two years at an annual expense to the Club of $1,200, the Kiwanians recently defrayed some of the costs with help from the rest of the community.

Most funding for projects comes from the Routt County Senior Services, including programs for residents of Hayden and South Routt County as well as Steamboat Springs. Senior Services, with an operating budget of $9,500 per year, recently held a fund raising drive to make up an anticipated $1,000 deficit. The fund raising was an alternative to increasing the cost of home meals above $1 or charging for activities that are now free. Senior Services also has a Council on Aging to review present services for the elderly and needs that must be met.

Paramount among those needs are transportation and housing. Transportation is a special problem in a cold climate where snow and slippery sidewalks can make even a short shopping trip dangerous. Consequently, Senior Services intend to increase bus service above what is presently available. Housing is an even more serious problem and it represents a substantial financial burden to many. If they own their own homes, they face rising property taxes. If not, rentals at reasonable rates are hard to find. Only one low-rent apartment building called Mountain View Manor is available to senior citizens in Steamboat Springs. It was financed through local donations and the Farmers' Home Administration. However, all units are filled in this building and some people have been on the Manor's waiting list for close to a year. A privately run nursing home, called Alpine Meadows, has also been available for about three years. It currently has around 40 patients, with about 75 percent receiving welfare aid.

Housing: Housing is not only a major problem for the elderly, but for everyone else as well. The ski boom on Mt. Werner and the resulting push for development have sent land prices skyrocketing. Interviews with residents indicate that $25,000 is the absolute rock-bottom price for a home, while something for under $30,000 is nearly impossible to find. These costs create a serious obstacle to people who wish to remain in an area, where local median income is less than the state average. Some long-term residents frankly admitted that should they ever be forced out of their present homes, they could not afford new housing in Steamboat Springs.

As a result, many of the young service workers live communally, sometimes packing more people into a house than zoning allows.* Others, including professional workers, have turned to the several available trailer parks as the only reasonable alternative.

Unfortunately, mobile homes, according to interviewees, are a dirty word in Steamboat Springs. Aesthetically, they are not very pleasing, and they probably do not provide a solution for families with children that would like to settle permanently. As an interim solution, however, some residents conceded they are an answer.

A developing trend to convert tourist to permanent housing will be helpful. The housing shortage in Steamboat Springs is for residents; the condominium market, on the other hand is overbuilt. This latter dwelling has questionable suitability for full-time occupancy and the cost may not be reasonable, either. In sum, because of the economic pressure of residents, transients and tourists seeking housing, it is doubtful that there will ever be low-cost housing in Steamboat Springs if left to the workings of the marketplace. Only private donations or government assistance appear able to alleviate the problem as they did in the case of Mountain View Manor.

Not only is housing expensive, but much of it is in need of repair. In a 1974 survey prepared by the Routt County Regional Planning Commission, over one-fourth of the respondents said their homes needed repair.

Employment: To a certain extent, the housing shortage is a result of the job shortage, or more accurately, the lack of well-paid, career-oriented work. According to 1974 data from the Colorado State Division of Commerce and Development, a plurality of the area's labor force (38 percent) is employed in retail trade or service related jobs that pay less than $100 per week. The part-time nature of many service jobs helps to account for the low salary level. Still, it is a sellers's market since the influx of educated, youthful transients provides a cheap, reliable labor pool for employers. This can make it difficult for those who wish to establish roots in Steamboat Springs but must compete for jobs with a continual flow of temporaries. The need for creating more jobs, particularly by attracting light industry, was mentioned by several interviewees.

After retail trade and services, the largest employment sectors in the area's economy are agriculture with 13.8 percent, contract construction with 8.9 percent, and transportation and public utilities with 8.7

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* In such cases, the city council's policy has been to take action only when a written complaint is received.

percent. Other employment categories include education (8.6 percent), mining (6.7 percent), government (4.2 percent), manufacturing (3.6 percent), finance/insurance/real estate (2.8 percent) and wholesale trade (1.0 percent). According to the State Division of Commerce and Development, the best wages were for those in mining ($218 per week on the average), federal government ($204 per week), contract construction ($180) and transportation and public utilities ($163).

Poverty, Public Services and Facilities: Poverty problems exist in the study area but like many ski resorts, those with low incomes are being driven out. Since counties cannot impose a residence requirement for welfare payments people are free to move in and out of the area and still qualify. In 1970, U.S. Census data indicated that 12.9 percent of families in Routt County were below the poverty level, compared to Colorado's 9.1 percent. But with the boom years, incomes have risen, and an article in The Steamboat Pilot (The Prospector, October 30, 1975, p. 8), noted that "most Routt County residents are earning more than they did in other years. . . ." However, applications for food stamps have increased each winter, with the majority of new applicants coming from young people in town for the ski season.

Public services and facilities appear to be satisfactory, though, as in many fast-growing areas, there is difficulty keeping pace with population increases. A capital improvements program and a million-dollar hospital expansion are underway.

The schools in the area were evaluated in a 1974 report by the University of Denver Bureau of Educational Research. It pointed out that: "Because of the recent additions to all three schools within the district, no immediate building construction appears necessary." The report did go on to note that: "This financially optimistic situation should not preclude the necessity for long-range planning and improvement of existing facilities."

Transportation

As is the case in many rural towns, transportation issues and concerns center on the major through highway, for Steamboat Springs, U.S. Highway 40. In town, the highway is Lincoln Avenue, Steamboat's main street. The transformation of the town, within the past few years, into a summer/winter destination resort area has greatly increased traffic and parking volumes. The Colorado Highway Department estimated average 1973 daily traffic on U.S. 40 at 5,000 and projected 15,000 in 20 years. In winter, especially, traffic along the highway between the town and the Mt. Werner ski area is congested. Also, traffic on the road includes a disproportionate number of heavy trucks.

The Highway Department is planning a major upgrading of U.S. 40, beginning five miles west of Steamboat Springs and progressing ten miles in an easterly direction to a point just beyond the juncture of U.S. 40

with State Highway 131. The improvements will include widening the highway to four lanes between Steamboat and Mt. Werner and constructing a central business district bypass via Yampa Avenue.

This construction can create sedimentation problems for the stream if not closely supervised. Once the construction is completed, there must be adequate facilities to handle urban runoff from the road to the stream.

The highway improvement is expected to make for safer, faster and more efficient traffic flow. Despite the inconvenience associated with construction, the road improvements appear to be favored by the town. The Highway Department surveyed over 1,100 citizens in 1972 and reported a concern over traffic problems and approval of U.S. 40 improvements in terms of safety and convenience. From another vantage point, a 3M National Advertising study (reported in The Steamboat Pilot, October 23, 1975) surveyed 500 tourists and reported bad road conditions as the number one complaint.

Due to strong local lobbying, a bicycle path is being included in the highway expansion. Presently the short bicycle trip between Mt. Werner and Steamboat Springs on the main roadway is both frightening and hazardous to bicyclists and motorists alike.

Construction of east, west and bypass segments of the highway is expected to take ten years. Land use along the highway could become more commercial unless regulated by zoning.

In-town traffic itself has increased as Steamboat has grown. Shopping and lodging facilities at Mt. Werner make it in effect a second town center and contribute to the traffic increases between the mountain and the town. In downtown itself, the post office has always generated traffic and parking problems as Steamboat residents do not have delivery service and must pick up their own mail.

A central business district "Parking Study," conducted by the town Planning Commission staff and released in June 1974, related future parking needs to town growth: ". . . as Steamboat continues to grow and as places of residence become more removed from places of commerce, the people of Steamboat will rely more on the automobile to do their daily business."

Alternate transportation modes in Steamboat, while they exist and are growing are still minor in comparison to auto traffic.

Shuttle bus service between downtown and Mt. Werner went on a no-fare basis during the 1974-75 ski season. The service is contracted by the city to the Steamboat Stage Co., and during December 1975 reported a total volume of 22,176 passengers, an 18 percent increase over the previous December. The buses run from 7:30 a.m. to 10 p.m. daily on a 40 minute schedule for a total of 22 runs each way per day.

A survey of skiers conducted in January 1976 for Weiner & Associates found only 22.3 percent of the respondents saying they had ever ridden on the free bus. The sample, chosen at random on lift lines at Mt. Werner, numbered 1,319. The skiers had gotten to the ski area primarily by private car (58.6 percent); 19.2 percent walked, 15.9 percent took the free bus, 2.7 percent took hotel transportation and 3.6 came by other means.

In the Weiner survey, the 22.3 percent figure corresponded with a similar percentage of respondents who were Steamboat residents. Many of the remainder did not even know the service existed.

Among comments elicited by the Weiner survey about the bus service were the following:

> Many people, especially residents of Steamboat II, Strawberry Park and areas to the east of Steamboat, said they would be willing to pay for the bus if it would run farther east and west.
>
> Many people said they had to use their cars in the evenings because the bus did not run past 10:00. Some recommended a minimal charge for the later service. (Note: the bus used to run later but these runs lost too much money because of insufficient patronage.)
>
> Some respondents wanted more stops added to the route, both in town and out.
>
> A "park and ride" system for getting around downtown Steamboat Springs was suggested.
>
> Ski racks should be installed on the outside of the buses; presently riders have to carry their skis onto the bus.
>
> Parking lots at Mt. Werner are small and some are quite far from the lifts, making bus transportation to the ski area attractive to some.
>
> Many people said, however, that they simply preferred driving or hitchhiking to riding the bus.

A bus service for Steamboat Springs senior citizens, bringing them downtown to shop, meet appointments or visit is run by the Kiwanis Club. Transportation for the elderly, a significant problem in Routt County, is discussed under socio-economics.

There is regular air service from Steamboat to Denver and Grand Junction as well as to some smaller Colorado towns. From 1974 to 1976 Frontier Airlines has increased its (winter) service from one to between 3-5 scheduled flights each way per day (Frontier's flights land at the Hayden Airport). Rocky Mountain Airways during this same period has gone from 5 to 8 Steamboat/Denver flights each way per day. In addition, Westair flies in and out from Grand Junction (on Saturdays only and just during the ski season). All incoming flights are met by Steamboat Stage Co. buses.

Continental Trailways buses between Denver and Salt Lake City stop at Steamboat twice daily in both directions. There is rail service but it is freight only, as is trucking.

Finally, a taxi service is operated by Steamboat Taxi Service, Inc. It is year-round, although it shut down briefly in the fall of 1975 due to a shortage of business.

Noise

Noise, which is often considered the ultimate environmental insult, is a problem in downtown Steamboat Springs associated directly to motor vehicle traffic. Levels of sound are usually measured in decibels (dB). Whispers might register as 20 to 30 dB on a sound-level meter, while a reading taken near a working jackhammer could be 115 dB or more. The decibel scale is logarithmic so that a twofold increase in sound is shown as an increase of 6 dB. Ear discomfort begins at 120 dB, while pain results at 140 dB. Length of exposure is also important so that long term exposure to perhaps as low as 75 dB is claimed to cause gradual loss of hearing. For this reason many municipalities prescribe an 80 dB limit, measured at 25 feet from the source on the A scale. Steamboat Springs has not adopted such a standard so that awkward nuisance complaints must be used to abate problems.

During the first week of December 1975, measurements were taken by the EIS team using a General Radio Type 2 (model BR 1565-B) instrument. Noise level measurements varied with traffic movement as indicated below:

Airport Road at Elk River Road	40 dB (A)
U.S. 40 at Elk River Road	58-65
U.S. 40 at west edge of City	62-84
Lincoln Ave. (U.S. 40) at 3rd	60-78
Lincoln Ave. (U.S. 40) at 5th	58-91
City Hall	53-65

Noise measurements at the Mt. Werner plant remained near 45 dB with little fluctuation, while the Steamboat Springs site measures in the 50-55 dB range peaking to 65 with traffic movement in the adjacent residential area. Based on resident interviews and measurements, noise does not appear to be an issue associated with this facilities plan. However, traffic noise will continue to be a problem even with U.S. 40 improvements.

Solid Waste

The Steamboat Springs area has been using a designated solid waste disposal site near Milner, 11 miles west of the city. According to State Health Department officials, this site is, or soon will be, permanently closed because of capacity limitations. The County has been urged to provide a site near Steamboat, however, none has been proposed to date. A suggestion of using an existing Oak Creek site (25 miles southeast) is considered unreasonable, principally because of its distance. Disposal of well digested sludge at Oak Creek would be considered acceptable to State Health because no water table leaching would be present at this elevated site.

Demographics

Routt County is 171 miles from Denver. Its northern edge borders Wyoming, and the Colorado counties surrounding it are Jackson, Grand, Eagle, Garfield, Rio Blanco and Moffat. The Routt County subdivisions include Hayden, Oak Creek, Steamboat Springs and Yampa. The county seat is Steamboat Springs.

Overall, the population of Routt County consists of native born Coloradians with an education comparable to the statewide average. Colorado, along with six other states, ranks second, only to Utah (12.5) in the U.S. median years of education. There are fewer children under the age of five than is the case in general in the state.

The following discussion is based upon 1970 Census data. The 1970 Routt County population is divided into 83.1 percent rural nonfarm and 16.9 percent rural farm residents. Of the 353 farms in 1970, 291 had sales of $10,000 to $39,999; and 15.5 percent exceeded $40,000. This compares favorably with farms throughout Colorado, where only 42.7 percent of farms had sales between $10,000 and $39,000. The short growing season is reflected in agricultural production of 13.4 percent in crops, and 85.7 percent in livestock and livestock products.

The median income for Routt County is $7,494 as compared with the state's $9,555. Routt County families making more than $15,000 represent only 11.7 percent of the population while the state's percentage is 19.7. Percapita income is $2,631 in Routt compared to $3,106 for the state.

There are no racial minorities reflected in the 1,122 rural farm population, and 31 minorities in the 5,479 rural nonfarm population. The median school years completed were 12.4, identical with the state average.

Persons under five years of age, 7.5 percent, are fewer than the state's 8.4 percent, and those over 65 years of age exceed the state average, 9.7 compared with 8.5 percent. Both of these differences are reflected in the Routt County median age of 28.5, 2.2 years above the state median.

Recreation

Routt County and Steamboat Springs offer a wide range of recreational activities. Downhill skiing is the area's main attraction, so much so, that ski-related income and employment dominate the local economy. LTV's expansion of the Mt. Werner slopes was followed by development of the Stagecoach area, 25 miles south of Steamboat Springs, and plans for construction of the Columbine ski area, 35 miles to the north of town at Steamboat Lake. Although the last two are not operating, skiers from around the country continue to flock in record numbers to the existing trails on Mt. Werner. Meanwhile, developers hope that new lifts can be built at Harrison Creek about eight miles southeast of Steamboat Springs.

Downhill skiing is complemented by a host of other winter sports. As noted by Charles Gathers and Associates, there is virtually unlimited terrain for cross-country skiing. Strawberry Park, just north of Steamboat Springs, was to have been the site for the 1976 Olympic cross-country events. Ski jumping, a popular local activity, would have been held at Howelson Hill, adjacent to and south of downtown Steamboat.

There is also ice fishing at Steamboat and Pearl Lakes, swimming at heated pools in downtown Steamboat Springs and on Mt. Werner, skating and hockey at Howelson Hill, and practically unlimited areas for sledding, tobogganing, snowmobiling and snowshoeing.

In the the summer cool nights and warm days contribute much to the area's popularity as a resort. LTV and the Steamboat Springs Chamber/Resort Association have joined with other ski counties in Colorado to promote their warm weather activities. LTV operates the Cliff Buchholz tennis ranch and a golf course on the mountain. And, needless to say, the area's vast open lands, woods, mountains and streams provide an excellent locale for hiking, camping, fishing, horseback riding and just plain sightseeing.

Between the summer and winter seasons, these same locales become crowded with hunters, seeking the variety of wild game in the area, especially elk and deer. Residents also like to hunt, often as a practical way of reducing food costs in a place where making ends meet can be difficult.

Howelsen Hill Ski Jump

Steamboat Ski Area (Mt. Werner)

Aesthetics

The summer lushness of the Yampa Valley is especially impressive when viewed from a hilltop. The swift flowing Yampa and innumerable fishing steams flow through forests and lush meadows. What had been grazing land for abundant game has now become largely cattle range. But the Ute summer hunting grounds remain a mecca for sport hunters and fishermen, and more recently cross country skiers and backpackers.

The largest group of mineral springs in Colorado give Steamboat Springs a unique character. Skiing has been a tradition here long before it was a major industry. Otherwise, the town is distinguished, especially from other ski resorts, by its enduring ranch character: cowboy hats ride the heads of genuine ranchers, and the breadth of Lincoln Avenue is a reminder that it was used, often, for running cattle.

Besides the town, the other noticeable manmade features of the area include: cuts on Mt. Werner for skiing and the resort facilities below; pronounced road cuts for access below the Ramada Inn; the airport; the railroad; highways and associated strip development; and residential and commercial development, including trailer parks, single family lots and multi-family structure complexes.

Culture

Within the last five years, the arts in Steamboat Springs have undergone a dramatic expansion. A Western history room was opened in the Bud Werner Memorial Library. The Arts and Humanities Council raised over $30,000 in funds to restore the old Denver and Rio Grande Western depot as a cultural center for the community. And an annual three-week summer Arts Festival was instituted in 1974. The Festival in 1975 included visual arts, theatre, dance and performances and workshops of the Colorado Philharmonic and Denver Symphony Orchestras.

These joined the Tread of the Pioneers Museum, Parry-Mansfield School's summer drama and dance programs and some local art galleries on the Steamboat Springs culture scene.

In addition, a number of young artists have moved into the area. One of them, painter Dennis Pendleton, is quoted in The Steamboat Pilot (November 13, 1975) as saying that, "No other community in Colorado offers the same kind of help and enthusiasm as is found here."

Other Federal Projects

A number of other Projects involving federal or state government should have an impact on the study area. They are summarized in the text that follows:

The proposed Yamcolo project, a 9,000 acre-foot reservoir to be situated on the upper Yampa (Bear) River in Garfield County, south of Routt County. To be used for irrigation, it will make the river level easy to predict and make planning easier for Steamboat's sewage treatment plant, according to Steamboat Springs City Manager, Roger McCoy. Sources of funding for the reservoir could include industry, a .57 mill levy increase in Garfield County, a combination loan-grant from the federal government under the Small Projects Act, and a $1 million loan from the Colorado Water Conservation Fund.

New coal leases to be granted by the Bureau of Land Management (BLM) after completion of an environmental impact statement. The impact on the study area will be felt in two ways. First, there will be a population increase caused by miners who will prefer to live in Steamboat Springs for its commercial, recreational and other advantages, even though the mines are in southern and western Routt County. Second, there will be temporary sedimentation problems in the Yampa River caused by road construction and related activities. A possibility that environmental groups will file suit against the BLM's environmental impact statement as they have done in Wyoming and Montana could prevent or delay the granting of the leases.

The Harrison Creek ski area, a proposed development located approximately eight miles southeast of Steamboat. Its capacity could be for 6,000 to 8,000 skiers daily. A decision on whether to approve the plan or not must wait until the U.S. Forest Service has completed a regional study on wilderness and recreational needs for the Routt National Forest, in which Harrison Creek would be located.

A plan by the U.S. Bureau of Reclamation to build several hydroelectric power plants and transmission systems, which will interconnect with federally supported steam plants operated by the Rural Electric Associations. The latter includes plants at Hayden and Craig run by the Colorado-Ute Electric Association.

A proposed improvement of U.S. Highway 40 by the Colorado Division of Highways and the U.S. Department of Transportation. The project, as described in the draft environmental impact statement, "would upgrade, modernize, and improve safety conditions and would relieve congestion on a ten-mile segment of U.S. 40, east and west of Steamboat Springs." However, this project could pose water runoff problems. Coordination must occur between engineers for the road and sewage facilities to prevent any drainage hazards. The relocation of sewage outfalls may also be necessary, since they cannot be below a major highway.

A possible water diversion, the Sheephorn Project, which will affect some 600,000 acre-feet per year of "runoff" water along the Continental Divide. Fifty agencies, groups, and individuals recently filed court protests on the plan as proposed by Vidler Tunner Water Company, a private outfit which along with the city of Golden, Colorado, wants to take water from the Colorado, Yampa and Blue Rivers to Golden and the Denver metropolitan area. Most of the 50 entities involved are local, county or regional, not state or federal. However, in a separate but related suit, Vidler Tunnel Water Co. and the City of Golden applied to the Federal Power Commission (FPC) for permission to begin a preliminary study of potential hydroelectric facilities. The FPC licenses all such facilities in the country. If a go-ahead is granted to the company, then all public lands in the project will be withdrawn from any other entity until the FPC makes a decision.

V. Description of Proposed Alternatives

The planning effort for wastewater facilities has conbined the comments and recommendations of numerous individuals representing Wright-McLaughlin Engineers, EPA, Colorado Health Department, City of Steamboat Springs, SSRSA member districts, Weiner & Associates, Citizens Advisory Committee and the General Advisory Group. This consortium narrowed down an original list of 55 sewage treatment configurations to four basic alternatives plus a no-action approach. These proposed alternatives are shown in Table XXII; they utilize the existing Mt. Werner District facilities, for flow leveling, retiring the Steamboat Springs plant in 1985, in the case of Alternatives III and IV.

TABLE XXII

FINAL FOUR TREATMENT PLANT ALTERNATIVES

Alt. No.	Plant Location	Process	Facilities Plan Designation
I	Steamboat Springs Lagoons	Extended Aeration-Advanced Biological Treatment	Steamboat E/A-ABT
II	Steamboat Springs Lagoons	Extended Aeration-Mixed Advanced Waste Treatment	Steamboat E/A-M/AWT
III	Midway Regional Site	Extended Aeration-Advanced Biological Treatment	Midway E/A-ABT
IV	Midway Regional Site	Extended Aeration-Mixed Advanced Waste Treatment	Midway E/A-M/AWT

It should be noted that the proposed structural alternatives deal only with domestic sewage. They do not specify facilities for the control and treatment of urban and agricultural runoff or programs to control river bank erosion. However, Wright-McLaughlin states that the proposed alternatives have good compatibility for treatment of non-point discharges from urban areas, resulting from snowmelt and storm runoff. Urban runoff could be detained at selected locations and metered into the sewage collection system during off-peak hours. Other runoff could be treated by detention/settling only, with some runoff receiving land treatment directly. The feasibility of controlling these sources will be considered prior to issuance of the final EIS and thus remains an unresolved issue in this draft.

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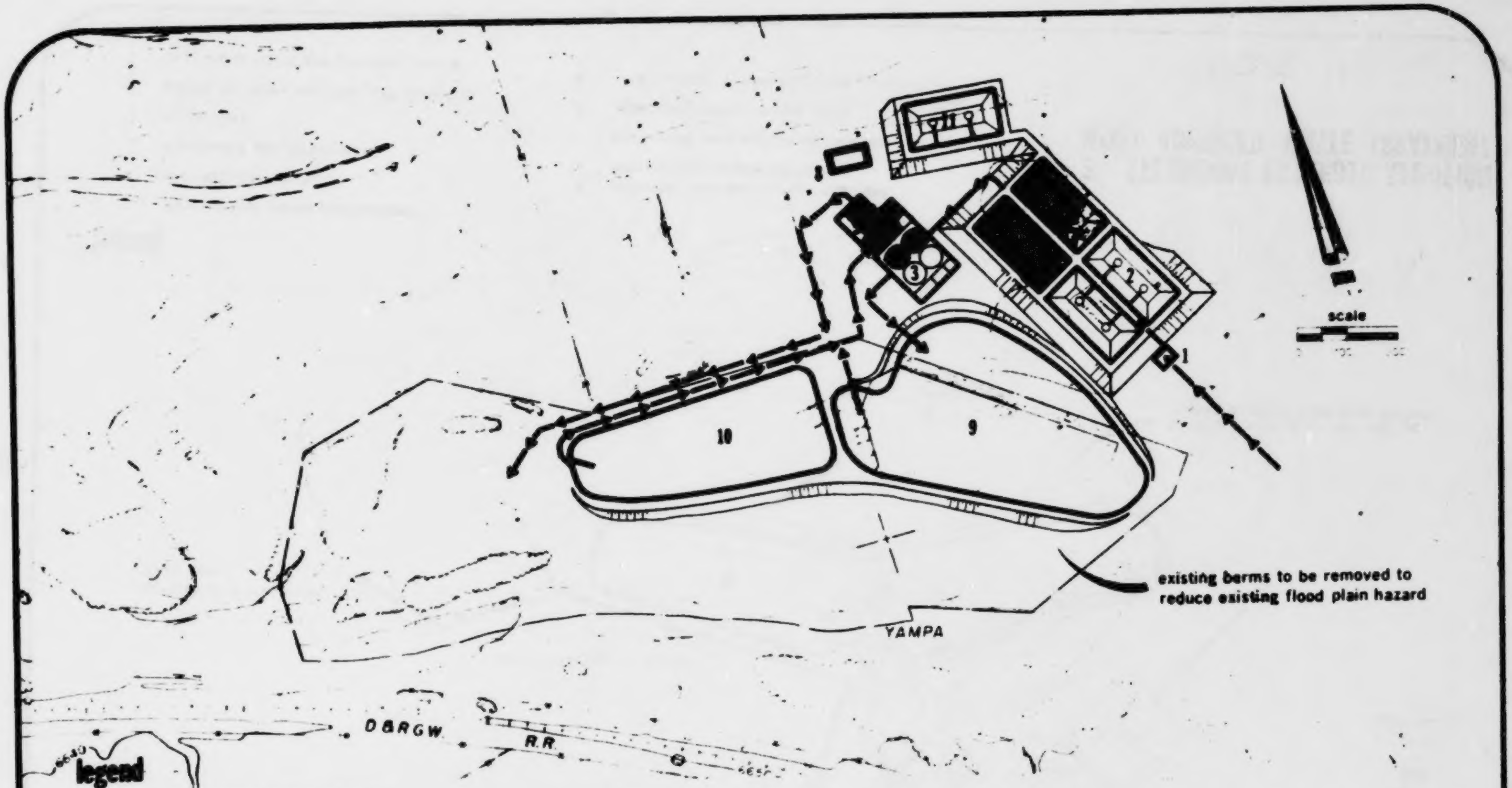
Alternative I - Present Site and In-Plant Tertiary Treatment

Alternative I calls for the long-term, continued use of the present city lagoon site as located on Study Map 1. This site is located wholly within the 100-year flood plain and adjacent to nearby residences. Regional treatment at this site would require pumping of sewage from Steamboat II, KOA Campground, Sleepy Bear, and Riverside (already pumping to site) via a 16,400 foot interceptor. The land use implications of this pumping are discussed in Chapter II.

The aerated lagoons at the present site would be modified for flow leveling and polishing purposes. The secondary treatment would be provided by new extended aeration facilities, but would require far less space, thus accomodating needed tertiary facilities. The tertiary treatment for ammonia would be achieved via an advanced biological process. This would involve activated sludge nitrification basins with secondary clarification and sludge return. Dual media filtration would also be used to remove suspended solids and organic material (BOD_5). Figure 10 displays this process configuration. First phase construction would include construction of pre-treatment facilities, three extended aeration basins, two clarifiers, modification of the existing lagoons, two dual media filter units and accessories, disinfection facilities, and the complete sludge system.

Alternative II - Present Site and Summertime Land Treatment

This alternative also uses the Steamboat Springs lagoons for the long-term plant site, plus the lands in Figure 5 for land application. The configuration of the plant is shown in Figure 11. This configuration is similar to that of Alternative I; however, the extended aeration basins are smaller because less ammonia treatment is required when land treatment is employed. The in-plant tertiary treatment will feature ammonia removal during the non-irrigation months, plus a dual-media filter for removal of suspended solids and organic material. The process for the removal of residual chlorine has not been specifically defined, but such plans will be determined prior to issuance of the final EIS. The precise location of the land treatment sites are not designated in this draft EIS but will be so in the final EIS. They will be located near the Midway Site where soil conditions, slope, water table and other criteria are all acceptable. The construction of the new facilities is designed to take place in 1977 and includes a pre-treatment facility, two extended aeration basins, two clarifiers, consolidation of the existing lagoons into one basin, two dual-media filters and installation of a portion of the land treatment equipment.



existing berms to be removed to reduce existing flood plain hazard

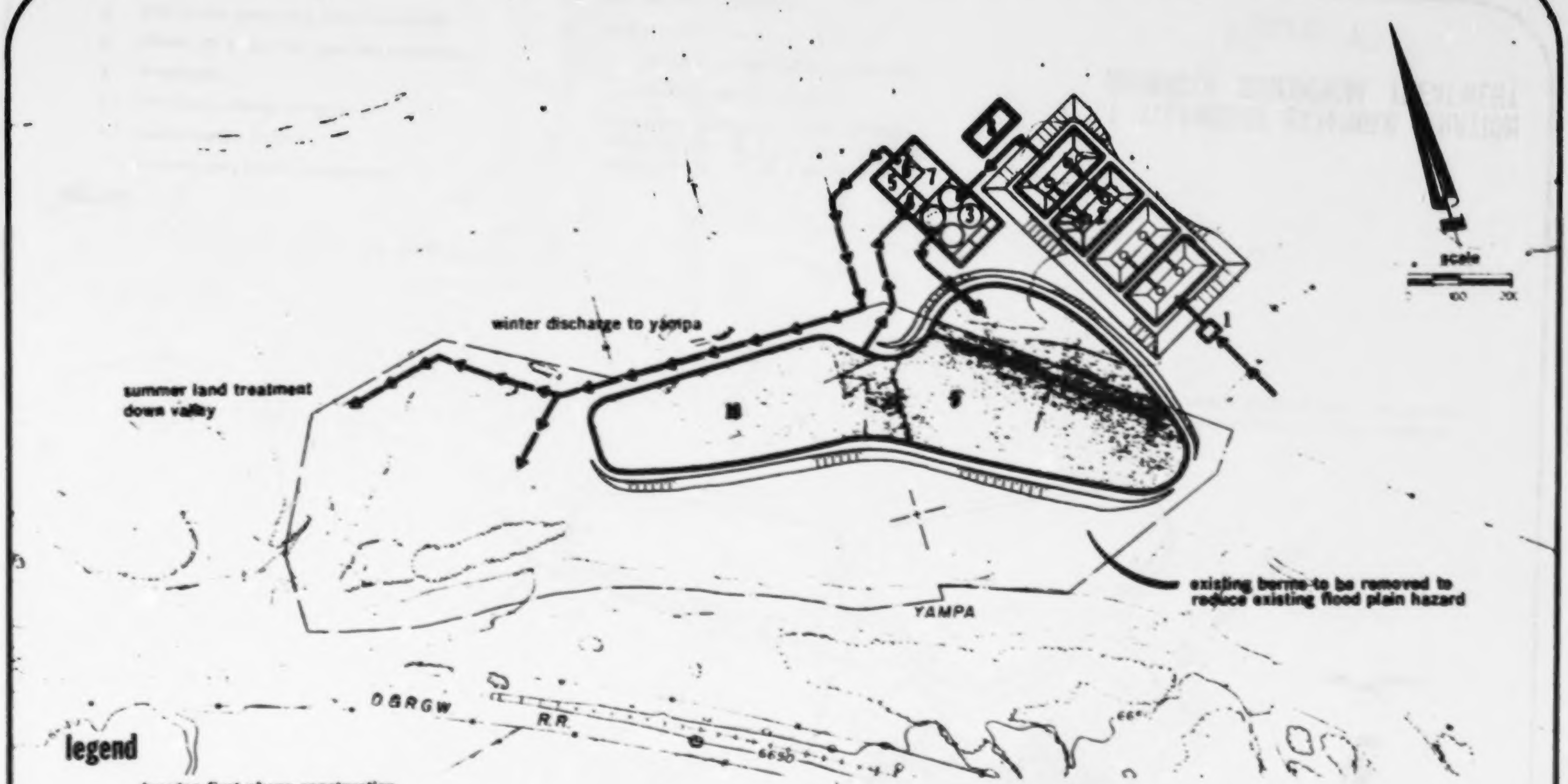
legend

denotes first phase construction

1 pretreatment facility
2 4-extended aeration basins
3 4-clarifiers
4 pumps for filters and filter aid chemicals
5 dual media filters and chemical mixing
6 chlorine feed and contact chamber
7 backwash tank, sludge facilities, return pumping facilities for nitrification, sludge handling and trucking facilities
8 emergency sludge drying beds
9 flow leveling & polishing pond (aerated)
10 flow leveling pond
11 aerobic sludge digestion

1 STEAMBOAT EXTENDED AERATION
ADVANCED BIOLOGICAL TREATMENT

Figure 10


scale
0
100
200
1
winter dischatge to yampa
summer land treatment down valley
YAMPA
existing berms to be removed to reduce existing flood plain hazard
DGRGW
R.R.
6650

legend

denotes first phase construction

1 pretreatment facility
2 4-extended aeration basins
3 4-clarifiers
4 pumps for filters and filter aid chemicals
5 dual media filters and chemical mixing
6 chlorine feed and contact chamber, treated wastewater pumping
7 back wash tank and sludge facilities
8 emergency sludge drying beds
9 flow leveling & polishing pond (aerated)

2 STEAMBOAT EXTENDED AERATION MIXED ADVANCED WASTE TREATMENT

Figure 11

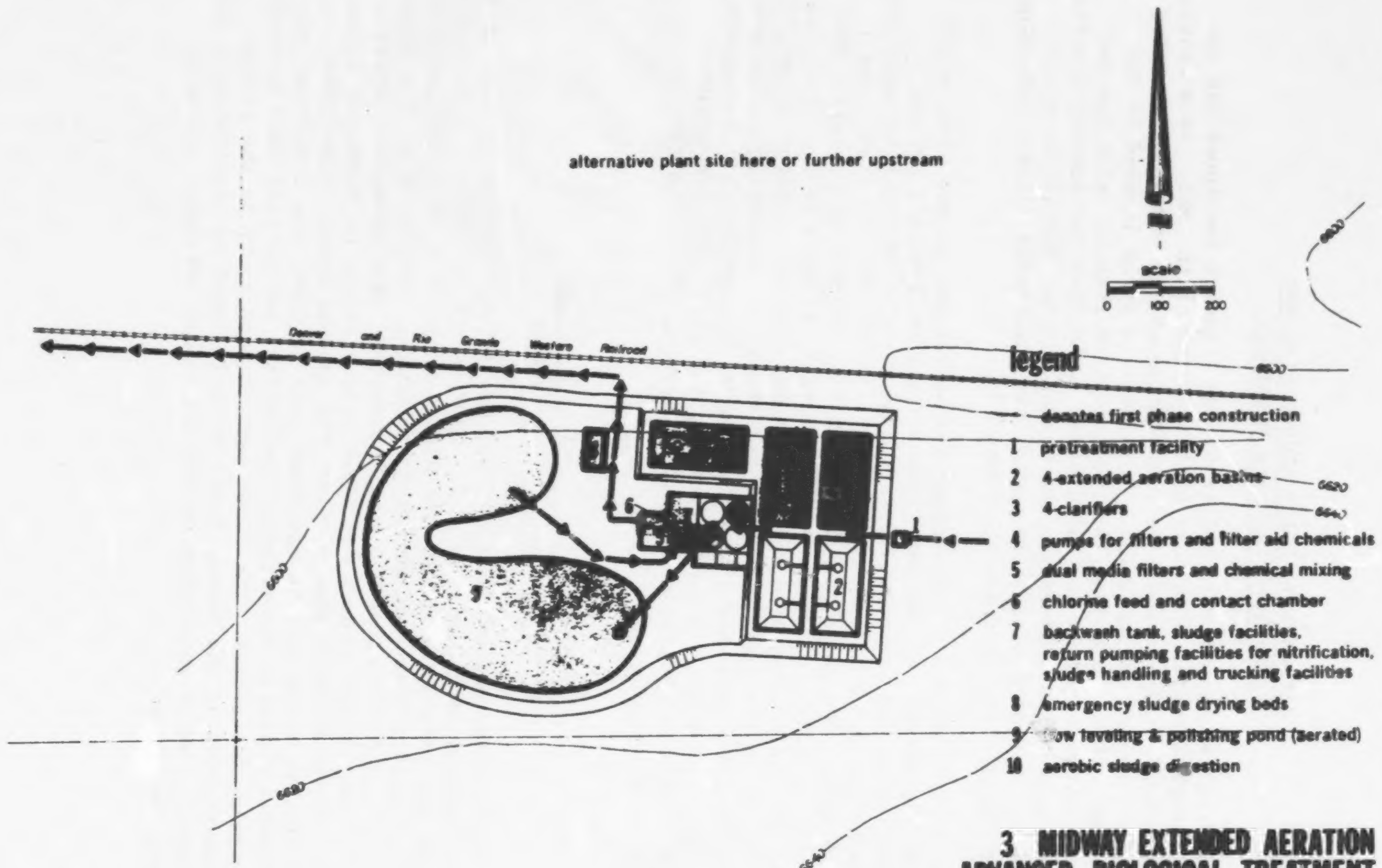
Alternative III - Midway Site and In-Plant Tertiary Treatment

This alternative is similar to Alternative I and it continues the use of the Steamboat Springs lagoons until retirement in 1985. As a result only limited facilities would be constructed at the Midway Site during the first phase of construction. This site is to be located in the general area shown in Figure 12. Construction phasing calls for two extended aeration basins and clarifiers, to be used for summer nitrification and back-up BOD removal in the winter. Other facilities would include an aerated flow leveling pond, two dual-media filters and chlorination facilities, as shown in Figure 12.

The collection system for conveying raw wastewater to the plant would utilize the current Mt. Werner lagoons for flow leveling purposes. In addition, a new 18-inch, 7,600 foot line would parallel the existing Steamboat Springs outfall. Another outfall (10,800 ft. @ 24") would be laid across the Yampa just below the City lagoons and parallel the river to the Midway Site; it would operate by gravity flow. Riverside would continue to pump to the City lagoons until its retirement in 1985, after which an interceptor would cross the river connecting to the new outfall. Sleepy Bear and KOA would like to the new outfall during the first phase of construction by crossing the river in a common interceptor. Finally, Steamboat II would be pumped across the river via the railroad trestle.

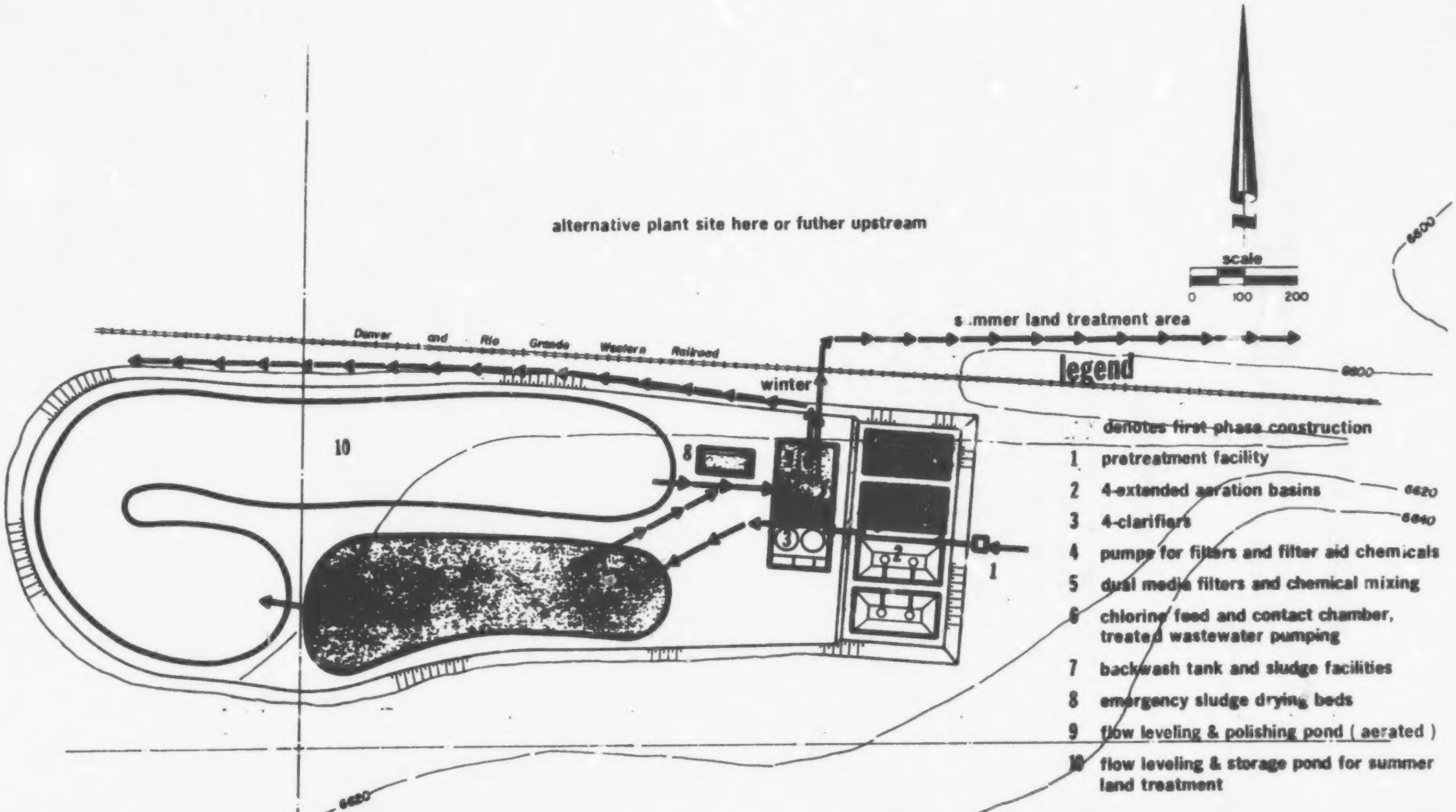
Alternative IV - Midway Site and Summertime Land Treatment

This alternative phases out the Steamboat Springs lagoons in 1985 in a manner similar to Alternative III. Interceptor and outfall construction is also the same as described for Alternative III. The principal difference is the tertiary treatment method for ammonia. In this case, the approach outlined for Alternative II, i.e., summertime land treatment, would be used in conjunction with a new plant site. Figure 13 shows the plant configuration while Figure 5 shows the general area. First phase construction would include the first aerated pond, one clarifier, two dual-media filters, chlorination facilities, and partial land treatment and sludge facilities. The first aerated pond would be the initial treatment step at the Midway Site, to be followed by clarification and filtration, which would provide the additional treatment necessary during the winter.


alternative plant site here or further upstream
scale
0 100 200
Denver and Rio Grande Western Railroad
legend
denotes first phase construction
1 pretreatment facility
2 4-extended aeration basins
3 4-clarifiers
4 pumps for filters and filter aid chemicals
5 dual media filters and chemical mixing
6 chlorine feed and contact chamber
7 backwash tank, sludge facilities, return pumping facilities for nitrification, sludge handling and trucking facilities
8 emergency sludge drying beds
9 flow leveling & polishing pond (aerated)
10 aerobic sludge digestion
6600
6620
6640
1
2
6
9

3 MIDWAY EXTENDED AERATION ADVANCED BIOLOGICAL TREATMENT

Figure 12


alternative plant site here or futher upstream
scale
0
100
200
summer land treatment area
Denver and Rio Grande Western Railroad
winter
legend
denotes first-phase construction
1 pretreatment facility
2 4-extended aeration basins
3 4-clarifiers
4 pumps for filters and filter aid chemicals
5 dual media filters and chemical mixing
6 chlorine feed and contact chamber, treated wastewater pumping
7 backwash tank and sludge facilities
8 emergency sludge drying beds
9 flow leveling & polishing pond (aerated)
10 flow leveling & storage pond for summer land treatment
1
2
3
8
10
6600
6620
6640

4 MIDWAY EXTENDED AERATION MIXED ADVANCED WASTE TREATMENT

Figure 13

No-Action Alternative

As the title implies, no capital expansion program would be initiated and the existing treatment facilities would continue in their present fashion.

Sludge Disposal

The four action alternatives will generate sludge in varying amounts with year-round in-plant treatment producing the most. The alternatives would all use sludge thickening and aerobic digestion, with land application for final disposal. The actual site for application has not been identified but will be so for the final EIS. Although surface spreading of digested sludge and land injection are considered, the process will depend on the treatment alternative selected. A special truck designed for land trenching is also proposed in conjunction with in-plant tertiary. The disposal technique is a significant consideration so its details must be defined prior to the publication of a final EIS for this project.

VI. Evaluation of Alternatives

This section sets forth the projected impacts associated with the four action alternatives and the one no-action alternative. Alternatives I and III refer to in-plant treatment at the existing and Midway sites, respectively. Alternatives II and IV refer to the land treatment options at the existing and Midway sites, while Alternative V is the no-action alternative. All of these alternatives are discussed in the text that follows under the headings of water quality, geology, soils, biology, air quality, land use and cost.

Water Quality

The impacts on the area's water quality can be divided into those on surface waters and groundwaters. If any of the action alternatives are implemented, and the discharge regulations are adhered to, the impacts on surface waters should be positive. However, the overall quality could still deteriorate if urban and agricultural runoff are not checked. If the no-action alternative occurs, the impact on surface waters would be negative; for increased effluent loads of the future would exceed the capacity of the existing plants to adequately-treat them. The resultant discharges would be of a lower quality and the impacts on the Yampa River would be negative. If a land treatment alternative is developed, both surface waters and groundwaters could be impacted. The surface waters could receive impacts from underdrains if the lowlands are irrigated. Their quality would have to comply with the discharge permit. The impact on groundwaters depends on the quality of the effluent and on application rates. The resultant impact should not contribute to water quality changes that exceed EPA's recommended drinking water standards. The details of these contingencies are discussed in the text that follows.

Alternatives I and III

Alternatives I and III are the in-plant alternatives at the existing site and the midway site, respectively. Their operational goals are the discharge of effluents that meet the 1983 standards, as delineated in the previous section on water quality goals. Assuming these standards are met or exceeded, the impact on the existing Yampa River ecosystem would be beneficial.

Site Selection: The two sites being proposed for the secondary treatment facilities are the current and the Midway site, each of which is described earlier. The Midway site has a more westerly location and lower elevation, where it can receive sewage from the entire SSRSA study area by gravity, except for the Steamboat II area.

Such a system provides for greater operating reliability and lesser operation and maintenance costs. This system could not be used as extensively at the existing site due to this site's higher elevation. However, if land treatment is employed, the existing site would be in a better position to provide gravity flow to the lowlands near Midway. Based on these considerations, the Midway Site appears to be the best choice for the treatment plant.

Another site consideration is the choice of a sludge disposal area. This site should be on nearby uplands, where the water table is greater than five feet below the surface. Sludge would be trucked to such a site and deposited in trenches. If this alternative is implemented, underground monitors will be installed and periodically checked for water quality. The water quality would have to conform to EPA's proposed Drinking Water Standards.

Secondary Treatment: Two types of biological treatment systems have been proposed for the secondary level treatment. The first is the extended aeration-activated sludge process; the second is the newer Bio-Disc rotating biological filter process. The configuration of these treatment schemes would be the same at either of the two sites.

The comparative waste treatment efficiencies of these two processes are similar. Both have achieved greater than 85 percent removal of BOD and suspended solids and both are fairly resistant to upset conditions, requiring a minimum of operator attention. The Bio-Disc process does not have a sludge return requirement which implies greater simplicity, but it does require primary clarification and subsequent anerobic digestion of the sludges. Waste sludges from the extended aeration process would be aerobically digested and would generate less sludge than the Bio-Disc system. This process would be easier to operate and less susceptible to upset conditions, but it would demand a higher power requirement for the oxygen supply. Despite this requirement, the extended aeration-activated sludge system is preferable due to higher costs of purchasing a Bio-Disc system.

Tertiary Treatment: The in-plant biological tertiary treatment systems considered for the Steamboat Springs region consist of an activated sludge nitrification facility and the Bio-Disc rotating filter system. If the Bio-Disc system is used, an intermediate secondary clarification system would not be required. The activated sludge facility would consist of a separate entity located in series with an extended aeration treatment step. The treatment efficiencies documented by both processes are high enough to meet the ammonia discharge levels, calculated by the design engineer for the proposed ammonia discharges. Both of these nitrification systems are temperature dependent and the rate of ammonia conversion decreases as influent temperature decreases. Thus, the development of a good, active biomass for the nitrification process could be a problem during the winter months in the Steamboat area. This consideration would be especially applicable to BOD removal rates. In addition, since biological systems are not easily or quickly started at these temperatures, both of these systems should probably be maintained on a year round basis. Switching between an inplant and a land irrigation system, and then back again, would likely raise serious operating and control problems.

Since the Bio-Disc system does not require a sludge return stream, it is inherently easier to operate and probably less susceptible to upset via operator error. However, capital costs would be much greater in the Bio-Disc System and would probably preclude its use.

Process Performance: The sensitive parameters to be handled by the treatment processes include ammonia, chlorine, BOD and suspended solids. Ammonia would be controlled by one of the two previously-mentioned biological systems, where nitrification would convert ammonia to nitrate. Either of these systems is designed to produce a discharge that would result in a river concentration less than 0.02 mg/ℓ of un-ionized ammonia. This level has been selected by the EPA to protect fish and aquatic life. The possibility of it being exceeded would be greatest during the summer if in-plant processes are providing the tertiary treatment. During the rest of the year, the possibilities would be slight. Due to these conditions the Colorado Water Quality Control Division is expected to issue a variable ammonia discharge permit and will provide requirements for operator monitoring. The ammonia portion of the new permit will be implemented after upgrading of the new facilities.

Associated with future reductions in ammonia will be increases in nitrates. The effect of these nitrates cannot be predicted, yet in certain situations they are known to stimulate algal growths. The EPA recognizes this potential problem and is in the process of modifying the test used to assess nitrates in lakes, so it can be applied to streams. When this modification is made, tests will be run on the Yampa River and safe levels of nitrate loading will be developed.

The situation for chlorine is regulated by their current discharge permit, which specifies that discharges of residual chlorine should be less than 0.5 mg/ ℓ. The existing permit expires on June 30, 1976; however, a revised permit from the Colorado Water Quality Control Division will include a new limitation for total residual chlorine, to be complied with upon upgrading the facilities. This revision will reflect the EPA's recent research on the matter.

The proposed EPA Criteria for Water Quality, October 1973 recommends that maximum acceptable residual chlorine concentrations in waters be less than 0.003 mg/l for chronic exposure. Maximum concentrations could be 0.05 mg/l for a period of up to 30 minutes in any 24-hour period. However, recent communications from Dr. Brungs of the National Water Quality Laboratory, Duluth, indicate that these values should be re-evaluated. The revised recommendations are as follows:

Type of Chlorine Use		Concentration of Total Residual Chlorine	Degree of Protection
Continuous	A.	Not to exceed 0.01 mg/l	This concentration would not protect trout and salmon and some important fish-food organisms; it could be partially lethal to sensitive life stages of sensitive fish species.
	B.	Not to exceed 0.002 mg/l	This concentration would protect most aquatic organisms.
Intermittent	A.	For a period of 2 hours a day, up to, but not to exceed, 0.2 mg/l.	This concentration would not protect trout and salmon.
	B.	For a period of 2 hours a day, up to, but not to exceed 0.04 mg/l.	This concentration should protect most species of fish.

Dr. Brungs further indicates that, "if free chlorine persists, more restrictive criteria are warranted. Alternate procedures or substitutes for chlorination should be investigated." Dr. Brungs feels that this approach is well founded since residual chlorine is more persistent than the few minutes or hours indicated by some authorities. Further, the current state of art in aquatic chemistry is not sophisticated enough to allow chlorine modeling in streams, so that a case-by-case evaluation may be necessary.

There are several analytical methods currently being used to determine residual chlorine. Some, like the orthotolidine method, are subject to gross interference from other oxidizing agents, turbidity, and color. Additionally, orthotolidine is extremely instable at low pH values and cannot be used to measure chloramines or total residual chlorine. Since the toxicity of free chlorine and chloramines are of the same order of magnitude, Brungs recommends that the amperometric titration method be used. He indicates that Duluth has consistently measured total residual chlorine in effluents at the 0.002 mg/ℓ (+100%) level using the amperometric method. Marlin Helming, of EPA's Denver laboratory, has stated that they are able to measure total residual chlorine in effluents down to the 0.02 mg/ℓ +50%). It appears, therefore, that the detectability of total residual chlorine should not present a problem.

Methods of dechlorination and alternate means of disinfection are available. However, recent work by EPA has indicated that, perhaps, not all of the total residual chlorine is being removed with several of the currently used methods of dechlorination. Both salmonid and non-salmonid fish are apparently able to detect chlorine below analytical detection limits. Zones of passage must be maintained in streams to prevent avoidance reactions. Regarding alternate methods of disinfection, such as ozone or other nascent compounds, consideration must be given to the potential impact which they or their byproducts can have on non-target organisms.

It has been recommended that an aeration system be used to dissipate the chlorine prior to discharge. The ability of aeration to accomplish that goal is seriously questioned. Wright-McLaughlin Engineers have been advised to review this proposal and to re-evaluate dechlorination and alternate means of disinfection. This issue must be decided before the EPA can approve the facilities design.

The treatment of BOD and suspended solids should be adequately handled by the proposed systems. The BOD removal rates will vary with temperature, being lowest during the winter. However, the dual-media filter will assist the biological processes during this time by filtering out organic matter. The suspended solids will also be removed by this process, as well as by settling.

Despite these proposals to control the quality of the discharge, one natural pollutant could still reduce the quality of the Yampa River. This parameter is zinc, which appears in the influent at the existing Steamboat Springs plant (Table XXIII). Although this element should concentrate in the sludge, the level of concentration is not known. If no concentration occurs, it could still be diluted by the river. During other periods it could actually dilute the river's concentration, which varies from zero to 0.55 mg/ℓ at nearby monitoring stations. In either case the potential impact cannot be determined with existing information. Consequently, the EPA recommends future monitoring of zinc in the effluent, as well as the immediate receiving waters. Such monitoring is not a prerequisite for the construction grants program, yet the results of such monitoring will improve our understanding of a potential hazard to the water quality of the Yampa River. This information could also provide a basis for future control programs if deemed necessary or feasible.

Table XXIII

Influent Water Quality[1]

Parameter	Concentration (mg/l)
Suspended Solids	45
Total Dissolved Solids	255
Phenols	<0.001
Oil and Grease	17
Ammonia-nitrogen	6.2
Organic-nitrogen	10.5
Kjeldahl-nitrogen	18
Nitrate-nitrogen	1.3
Phosphorus	2.6
Settleable Solids	7.0
Trace Elements[2]	
Aluminum	0.5
Boron	0.5
Copper	0.01
Iron	0.1
Lithium	0.1
Manganese	0.1
Strontium	0.1
Silver	0.001
Titanium	0.01
Zinc	0.02

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[1] Received April 12, 1976; analyzed by the Industrial Laboratories Company.

[2] Other trace element below level of detection.

Alternatives II and IV

The two land treatment Alternatives for tertiary treatment of wastewaters are alternatives II and IV. Both of these alternatives would divert secondary effluent, treated and disinfected, into the valley bottomlands near the Yampa River or into nearby uplands. Both of these lands would be irrigated during the normal irrigation season, extending from July to mid-October. As a corollary to this approach, sludge would also be applied to these lands, distributed on a year-round basis.

The land application of wastes for wastewater treatment is not a new practice. A survey conducted by the American Public Works Association (1972) documents at least 315 municipal systems that use this approach (Sullivan, Cohn, and Baxter, 1973). A second study conducted in the Rocky Mountain-Prairie Region identifies 19 municipal sites that use the land application approach (Dean, 1974). These latter sites occur in Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, where applications are used for irrigation of golf courses, crops, hay and/or pastures.

Land application approaches are generally classified as irrigation, overland flow, and infiltration-percolation. The approach for Steamboat Springs is intended to be irrigation and/or irrigation-overland flow. Irrigation, in this sense, would be construed as the controlled discharge of effluent to support plant growth. The basic environmental assets of this action would be: 1) to renovate the waste effluent prior to discharge; and 2) to beneficially support crop production. The principal constituents to be removed would be ammonia-nitrogen, biochemical oxygen demand and suspended solids.

Land application uses the land and its associated biological systems as a living filter. The renovation is both microbiological and physiochemical in nature and includes chemical precipitation, adsorption, absorption, filtration, plant root uptake and oxidation. Many of the impurities that are entrapped in the soil are eventually used by higher plants as growth components and, in the process, the wastewater receives the equivalent to tertiary treatment.

The discussion that follows describes this kind of treatment, under the headings of climate, wastewater application, site and soils, treatment efficiency, effects of nitrogen on groundwaters, effects of trace elements on groundwater, health considerations, and surface water runoff.

Climate: The climatology of a specific site affects the length of its growing season, the type of crop production, the kinetics of the breakdown of the applied wastes, and the quantity of wastewater that can be disposed. The operation of existing land treatment facilities have been documented for northern climates (Dean, R., 1974; Malhatra, S.K., et al., 1975; Sanks, R. L., et al., 1976; Sopper, W. E., et al., 1975; and Sullivan, R. H., et al., 1973). Preliminary research near Steamboat Springs indicates that excellent renovation can be attained if the proper design and management is provided (Wright-McLaughlin, October 1975). Consequently, even though the short growing season of the Steamboat area would limit the length of the land application season, climate considerations should not inhibit successful renovation of the wastewater if proper loadings are applied.

Wastewater Application: The proposed method of applying the secondary effluent to the uplands would be by contour ditches with adjoining corrigations. The application rate would be approximately three acre-feet per acre per year. This rate is based on practical experience (Soil Conservation Service, Steamboat Springs) and is recommended by Donald Miles from the University of Colorado Extension Service. He also recommends that Reed Canary Grass be considered for planting because it has an uptake rate of 226 to 359 pounds of nitrogen per acre per year. Based on an average of 300 pounds per acre and 15 mg/ℓ of NH_3-N in the 1985 effluent, this would require 34 acres. However, the hydraulic loading requires 165 acres so the actual amount of applied nitrogen would be closer to 63 pounds per acre per year. This lower rate means that crops like wheat could be successfully treated since their uptake rate is close to 70 pounds per acre per year (Table XXIV).

The proposed method for applying effluent to the valley bottomlands is to be spray irrigation, although the EPA prefers that it be applied by flooding irrigation. Spray irrigation generates aerosols that could be hazardous to human health although their exact toxicities are not known. The rate to be applied is to vary between three and seven acre-feet per acre per year. Again, this range is recommended by Donald Miles of the C.U. Extension Service. The upper portions of the range are deemed feasible due to the installation of an underdrain system. This system would facilitate the passage of water through the soil layers and would discharge adequately treated water to the Yampa River. The point of discharge would be over 1000 feet from the edge of the irrigation plot. Despite these safeguards, though, clay lenses may exist at this site that could cause localized pooling, anerobic soil conditions and insect breeding. However, if this condition occurs, it could be mitigated by reduced hydraulic loading over the problem area.

The nitrogen loading at the 3-foot rate would be 63 pounds per acre per year. The loading at the seven-foot rate would be 147 pounds per acre per year. This latter value would be suitable for Reed Canary Grass although some supplemental fertilizing could be required. If alfalfa or grass are planted, additional fertilizer would not be needed. The amount of acreage required to treat 1985 flows should be 165 for the 3-foot rates and 70 for the 7-foot rates. In either case, the loading will be determined by hydraulic considerations, rather than nutrient considerations.

By the year 2010, the amount of acreage required for the uplands would increase to 218 acres. This amount is limited by the hydraulic constraint of three acre-feet per acre per year and provides a nitrogen loading of 84 pounds. It represents the most amount of land that could be required by 2010. If the lowlands are used as the disposal site, 134 acres would be required. This amount is based on the nitrogen constraint of 300 pounds per acre per year and the planting of Reed

TABLE XXIV

ESTIMATES OF N AND P_2O_5 UPTAKE BY CROPS WITH GOOD YIELDS

Crops	N, lb/ac	P_2O_5, lb/ac
Corn	160	60
Wheat	70	30
Sugar Beets	150	60
Potatoes	225	80
Alfalfa and Grass	170	45
Clover	80	20

Canary Grass. It would reduce the hydraulic loading from 7.0 to 4.8 acre-feet per acre per year, yet it would represent the least amount of land that would be needed by 2010.

The proposed means of applying the sludge is by spray irrigation. EPA prefers direct spreading techniques such as special vehicles in order to minimize the generation of aerosols. The volume of sludge would be around 1.2 million gallons per year in 1985; its solid content would be approximately one percent. The application rate of these waters in the valley bottomlands would vary between three and seven acre-feet per acre per year, and on the uplands it would be approximately three acre-feet per acre per year. The acreage required is a small percentage of that required for effluent disposal and is included in the previously-stated figures for effluent disposal. The sludge loads for 2010 are estimated to be 3.4 million gallons at two percent solids. The acreage required to dispose of these amounts is also included in the previously-stated figures on effluent disposal.

Site and Soils: Soil characteristics are one of the most important factors in determining the acceptability of a proposed land treatment site. Soils vary between predominantly clay soils with relatively low percolation rates to the sand-gravel types, with higher rates. The different rates are a result of the soil particle sizes and the spaces between them. Soils with the best combination of these factors are well-drained loams or sandy loams, for they would be capable of supporting good productivity in Steamboat Springs. Factors of additional importance would by pH, salinity, nutrient levels, and adsorption and fixation capabilities of inorganic ions (EPA, March 1975).

Factors that would be unfavorable for land treatment, according to R. L. Sands, T. Asano and A. H. Ferguson (1976), are listed below:

- slopes greater than 15% in forested areas and greater than 100% in grassland (under certain conditions there may be exceptions to these values depending on soil permeability and application).
- bedrock closer than three feet to the surface or extensive outcropping of bedrock (the EPA prefers five feet as a minimum).
- soils that swell more than 30%.
- infiltration rates that are either extremely low or SAR values that are high.
- water table closer than three feet to the surface during the spraying season (EPA may require a minimum of five feet or adequate underdrains).

- highly saline soils or highly saline wastewater.

- excessive boron or copper in the wastewater.

- several barely acceptable characteristics listed above, which in combination indicate an unsuitable site.

The soils of the project area have been previously described and will not be repeated here. The main impact on the valley bottom soils would be due to a high water table, which usually varies between 6 and 20 inches beneath the surface. It is higher during the spring and lower by fall. The proposed underdrain system should lower this water table and should provide adequate space for the irrigation at the three acre-foot rate. Irrigation at the seven foot rate may be excessive, however, during the first portion of the season. Because of this possibility, it is recommended that enough acreage be tied up to provide a safety factor. Although this factor cannot be determined with existing information, it is recommended that approximately 200 acres be tied up to provide for it. This amount would enable the wastewater flows of 2010 to be distributed at a rate of slightly over three acre-feet per acre per year, which represents the lower end of the recommended application range.

The soils on the upland terrace should be suited to the flood irrigation proposed, at the application rate of three acre-feet per acre per year. This contention is partially supported by a pilot program undertaken by Wright-McLaughlin Engineers (December 1974). It is also supported by Donald Miles, a soils scientist with the University of Colorado Extension Service and by records of the Soil Conservation Service at Steamboat Springs.

Besides hydraulic loading, other factors could effect the fertility of the soils under consideration. Trace elements do accumulate in soils and should be concentrated within the EPA's recommended levels for irrigation waters (March 1975). A comparison of these recommendations with the influent analysis in Table XXIII suggests that trace elements should not be a problem. Other possible hazards include high salinities or high sodium adsorption ratios. They, too, are not expected to be a problem.

Treatment Efficiency: Extensive investigations have been conducted during the past several years in an effort to identify the treatment efficiencies that might be expected from a well designed land treatment system. This information is now well documented (Pound and Crites, 1973; EPA, March 1975; and Sank and Asano, 1976) and is summarized in Table XXV. As can be seen from this table, the overall renovation expected from a properly managed land treatment system is excellent. Removal of BOD_5, SS, N, P, trace metals, viruses and bacteria are all excellent and such a system should have no difficulty meeting the 1983 design goals as developed by the design engineer.

TABLE XXV

ESTIMATED PERCENTAGE RENOVATION EFFECTIVENESS OF LAND DISPOSAL TECHNIQUES

	Spray Irrigation	Overland Runoff	Rapid Infiltration Ponds
BOD	99	80	99
SS	99+	80	99
N	70-90	60-90	30-80
P	95-99	60-80	50-90
Trace metals	95-99	60-80	50-90
Organic toxicants	99	60-80	90
Viruses and bacteria	99+	90	99+
Cations	50-75	30-50	30-75
Anions	0-50	0-10	0-50

Effects of Nigrogen on Groundwater: Nitrogen contained in wastewater usually takes the form of organic nitrogen, ammonium-nitrogen, and nitrate-nitrogen although organic and ammonium-nitrogen are the principal forms applied to the land. Organic nitrogen is usually present in suspended form and is filtered and decomposed into ammonium; ammonium-nitrogen is either gasified or oxidized to the nitrate-nitrogen. Nitrate-nitrogen is not retained in the soil but is either utilized as a crop nutrient, leached to the groundwater, or released as a gas following denitrification. The nitrates released to the groundwater are a potential hazard since concentrations in excess of 45 mg/l can cause methemoglobinemia in small children. However, this potential hazard should be controlled with the proposed application rates and the natural removal rates. The proposed application rates for nitrogen vary between 63 and 300 pounds per acre per year, and these amounts should be accommodated by several of the crops found in Table XXIV. Nonetheless, monitoring of groundwater will be undertaken to assure the program's success.

Effects of Trace Elements on Groundwater: Trace elements, heavy metals and refractory organics that are applied to soils are generally fixed in the soil particles and, in some cases, rendered nontoxic by bacteria. These constituents can be leached out of the soil, however, by excessive hydraulic loadings or by significant decreases in pH. Thus, adequate system management will be a necessary requirement. Trace metals should not be a problem at the Steamboat Springs site due to preliminary influent analysis (Table XXIII).

Health Considerations: The health hazards associated with wastewater use are caused by pathogenic bacteria, viruses, protozoa, worms and fungi. None of these are regularly analyzed although the hazard from pathogenic bacteria is identified indirectly through the measurement of fecal coliforms or total coliforms. The fecal coliforms come almost entirely from the digestive tracts of humans and warm-blooded animals, while the total coliforms come from many other sources as well. The relationship between fecal coliforms and disease organisms has been substantiated for Salmonella (Geldreich, 1970; Geldreich and Bordner, 1971), where a high correlation was established between Salmonella and fecal coliforms when fecal coliform densities exceeded 200 per 100 ml. Since the wastewater is to have less than this amount before land application, its content of Salmonella should be low. However, its content of other disease organisms cannot be predicted but they, too, may be low.

Viruses are more difficult to measure than bacteria but are also a potential health hazard. Research by Plotkin and Katz (1967) indicated that only one virulent virus is sufficient to infect a person if it contains susceptible cells. Also, Berg (1971) suggested that waterborne viral diseases need not occur at the epidemic level to be of significance. Infection could occur and not produce overt symptoms, and the infected individual could serve as a viral source for others. Although no large-scale spread of viral diseases is known to have occurred by the water pathway, a small outbreak has been reported that infected 800 people (Mosley, 1967). Viral diseases that could be transmitted by water include poliomyelitis, gastroenteritis and diarrhea; however, the most convincing evidence exists for infectious hepatitis.

Since most of the pathogens found in wastewater are from human sources, exotic pathogens may be of concern. Such organisms could come from foreign countries, transmitted by visitors to Steamboat Springs. Due to the foregoing viral information, viruses would pose the greatest potential threat but they still would have to contact susceptible cells to be destructive. The transmission of these viruses to susceptible people would be negligible for all the alternatives, except for those people that directly handle the wastewater. They would be in contact with aerosols that could contain an exotic virus but the possibility of infection would be slight.

The transmission can occur through groundwater percolation, crop contamination, or aerosol conveyance. The danger from percolation should be minimal since practically all bacteria and viruses are removed during passage through the first several inches of soil (Pound and Crites, 1973; EPA, March, 1975; and Spyridakas and Welch, 1976). Hazards from the pathogenic contamination of crops are a lesser known quantity, however. Crops slated for direct human consumption should not be irrigated with wastewater during the last month before harvest, especially vegetables. Other crops such as corn do not readily pick up and pass along intestinal bacteria but they could pick up other pathogens. Problems for grazing animals include the ingestion of parasites that are incorporated into range plants. However, past records indicate that this should not be a problem.

The conveyance of pathogenic organisms via aerosols is a major concern, especially where spray irrigation is used. Aerosols are simply droplets of liquid that have become airborne, and aerosols from municipal wastewaters do contain viruses and bacteria. The public health implications of these have not been adequately examined in the field, but health hazards have been postulated. A lack of evidence for disease transmission by these aerosols divides professional opinion on the question.

For the Steamboat Springs proposals several conclusions can be made and actions can be taken to mitigate these potential problems. First, aerosols are not a problem in areas where flooding is used instead of spray irrigation. However, runoff should be monitored for possible contamination. Second, if a spray irrigation system is used, application areas should be fenced or posted and provided with a buffer zone around the spray field. Low-pressure nozzles, with application streams pointed downward, would also help to minimize the aerosol formation. During windy days, the spray application should be minimized or even stopped completely. For the Steamboat locale, the low relative humidity will also tend to minimize any problem.

Experience in other areas is valuable in gaining insight into possible problems at Steamboat Springs. Currently, wastewater is regularly being applied to a number of Colorado golf courses where public contact is intensive; no apparent ill effects have resulted from this practice (Dean, 1974). The AWPA study of 1973 failed to show any significant health problems associated with land application (Sullivan, R. H. et al., 1973).

Another consideration is that irrigation waters will be fully treated to secondary levels and disinfected via chlorination. Thus, the effluent quality at the point of application should be quite high and reduce the danger of health hazards. Also the uptake of heavy metals by plants should be slight since the wastewaters are not expected to contain high concentrations. This means that any subsequent transfer to wildlife should be slight. Increases in local insect populations should also be slight if application rates are adjusted to minimize surface pooling and runoff.

Surface Water Runoff: If the lowlands are irrigated by secondary effluent or liquid sludge, some treated waters would be diverted to the Yampa River. These waters would be collected by underdrains and discharged as a point source. This discharge will require a NPDES permit, to be administered by the Colorado Water Quality Division. If violations occur from such a system, application rates would have to be reduced and more area would have to be irrigated.

Geology

If inplant processes are chosen for Steamboat Springs, or if no action is taken, the impact on the area's geology should be negligible. If the land treatment alternatives are chosen, though, impact could accrue to the water in the alluvium or the sedimentary layers. These possibilities are discussed in the evaluation of land treatment. If a 100-year flood occurs, then a geological hazard could impact the project facilities.

The 100-year flood plain is shown in Study Map 1 and indicates that the existing facilities would be flooded and the sewage lagoons surrounded. Such an occurrence would disrupt treatment and increase the polluting nature of the discharge. The river would be flowing at about 8,000 cfs, however, so its dissipating capabilities would be considerable. Perhaps a more serious impact would be the water damage done to the facilities. This potential damage can be minimized with the proper design and it is recommended that this be done. If the Midway Site is chosen, its location would be placed outside of the 100-year floodplain so that waterproofing contingencies could be eliminated from its development.

Soils

The soils of the project area would receive significant impact only if one of the land treatment alternatives is chosen. They should be enriched by the nutrients and trace elements in the wastewaters. However, yearly samples should be taken and analyzed so that the changing character of the soils can be observed.

Biology

The principal impacts on the area's biological systems are on the Yampa River if Alternatives I, III and V are chosen and on the cultivated fields if Alternatives II and IV are chosen. The former impacts are fully discussed in the evaluation on water quality and the latter ones are discussed in the evaluation on land treatment. None of the rare or endangered species should be directly effected by the four action alternatives, although the habitat of Colorado Squawfish and Bonytail Chub would be deteriorated by the no-action alternative. The survival of these fish is endangered and the no-action alternative would allow discharges of ammonia and residual chlorine to increase in their downstream waters. These discharges would deteriorate the quality of their habitat. Furthermore, development spawned by the action alternatives could eventually impact all rare or endangered species. This effect could occur against the fish by increases in urban runoff or against the birds from human encroachment on their habitat.

Air Quality

The study area currently violates state and national ambient air quality standards for total suspended particulate (TSP). The principal cause has not been identified but is probably road dust from the heavy traffic volumes along Lincoln Avenue (U.S. 40) and fugitive dust common to agricultural areas. Future growth and development, as facilitated by sewage treatment facilities, will aggravate this situation by increased traffic. However, the majority of the present traffic volume is through traffic, independent of area growth. In addition, a U.S. 40 by-pass will probably result in lower ambient concentrations of TSP by trip diversions. Street washing or other programs to control nonpoint discharges will undoubtedly improve this situation, as well, by control of street dirt.

The Midway Site offers a land buffer against noise and odor potential, and is therefore preferred. Low pressure spray irrigation of effluent is acceptable in the area proposed, while digested sludge spraying should be avoided due to aerosol uncertainties.

Land Use

In this section key issues are discussed regarding site and treatment alternatives as they relate to growth and land use. The "no-action" alternative is considered first, followed by discussions of the area's land use goals and how they would be affected by the Midway and existing sites, and by land treatment.

Alternatives

It seems quite unlikely that *no* action can be taken. Steamboat Springs sewer facilities are already in violation of water quality standards. More growth is expected and nearly all local residents interviewed felt that something should be done. Were federal monies not available, however, the city would probably have difficulty in finding the revenues to build even a minimally acceptable facility according to Brac Melton, Director of Public Works. The results could be rather negative, as follows.

New point sources of pollution along the Yampa River are currently prohibited because wasteload allocations are filled. New construction must, therefore, tie in with an already existing sewage system. If the city's facilities, the largest existing system in the area, were to be left unimproved, the State Health Department could order a halt to *all* new construction. This was the case in Montrose, where state officials ordered a local building permit moratorium under authority granted by the State Water Quality Control Act of 1973.

Some people, especially the young, already pack more roommates into a house than zoning allows. In addition, there is an urgent need for low and middle income housing. Therefore a moratorium, were it extended for any length of time, could intensify the already present housing and economic problems.

In all probability, a moratorium would also create such political pressure for building new sewage facilities that the federal government would eventually have to contribute funding or an extremely large bond indebtedness would have to be assumed by local residents, the latter being vulnerable to the bond sales market (See Chapter III).

Although the County and the City of Steamboat Springs have not yet adopted a comprehensive plan, land use and zoning maps and the goals formally stated by the Citizen's Advisory Committee (CAC) for the regional sewage authority provide a basis for determining desired long-term land use. The latter, combined with interviews of local residents and a look at existing trends, reveals a fairly clear pattern of what future land use should be (Study Map 2).

A prime goal is preservation of agricultural land. The water-oriented goals and policies of the Citizen's Advisory Committee state that: "All alternatives investigated must enhance the agricultural industry of Routt County and the SSRSA study area to provide a diverse economy for the stability of the region." As many interviewees noted, since the study area is overzoned, future population can easily be contained within already platted areas, making it unnecessary to rezone agricultural land for some other use. EPA's evaluation pays particular attention to this goal, since more than anything else, the pressure to convert agricultural property to other purposes has caused serious growth and socio-economic problems in the past.

No appreciable difference exists between plant site alternatives as far as their effect on land extending from the southwest edge of the study area north along Highway 40, encompassing the Mt. Werner, Fish Creek and Tree Haus areas. According to the unofficial 1995 land use plan, much of the future development should take place in this section, filling in the region between the Steamboat ski area and the town. Both Midway and the existing site will allow gravity flow from this area, facilitating the development that is planned. The use of the present Mt. Werner lagoons for flow leveling will provide an advantage by compensating for seasonal flow variations that result from extensive tourist accommodations in this area.

The original townsite of Steamboat Springs and West Steamboat is another major area slated for growth, according to the 1995 land use maps. Again, there is little distinction that can be drawn between plant sites as far as their impact on this area.

The area along both sides of the Elk River Road, from its intersection with U.S. 40 to the airport, (County 129), is mostly open land, but its location between the airport and town makes for a natural growth zone, especially for industry and commerce. Both plant sites would receive gravity flow from this area.

Land north of the airport is primarily open and is intended to remain that way according to Gathers. The River and Deer Mountain subdivisions are the only residental developments in this area. These approved satellite subdivisions are partially built out with future growth thwarted by soils conditions which prevent the use of individual septic systems. If interceptor sewer lines are extended to this area, sewage will have to be pumped uphill as far as the airport, regardless of which plant site is chosen. Although pumping would be a discouragement to growth in this area, a modern sewer system could facilitate development which is contrary to the draft comprehensive plan.

The broad expanse of land west of the Elk River Road/U.S. 40 Junction, extending north and south of the Yampa, is the principal area of land use concern. As shown in Study Map 2, this area contains both the proposed plant sites and land treatment area. The Riverside, Sleepy Bear, KOA and Steamboat II residental areas and the Selbe and Hogue farms are located along the north side of the river, while south of the river, land use is devoted to both irrigated and non-irrigated cropland as shown in Study Map 2. The concern is for the open farmland extending from the present city lagoons west to the Midway Site and beyond. A subjective argument exists regarding the role wastewater facilities play in influencing future land use. Will the selected plant site encourage, facilitate, or discourage growth in the remaining area slated to continue as agricultural? Specifically, there is concern that the Midway Site would facilitate development because gravity flow could be utilized in most of this area. Pumping, it is argued, with its extra costs, would be necessary if the present site is maintained, thus providing a growth deterrent.

On the other hand, north of the highway between Steamboat II and the present site there is only a finite amount of property that could be readily developed, namely the area in the immediate vicinity of Steamboat II, which would require pumping even to Midway, and another parcel across the road from Riverside. The remaining open land north of the Yampa is mostly on top of a mesa and is not likely to be developed due to construction costs and probably planning agency opposition. As for the area to the south of the Yampa, there is such strong community sentiment to maintain this land as agricultural that the selection of a plant site will not by itself provide an inducement to urban growth. For example, attempts to develop a mobile home park in this area have been vigorously resisted. Those interviewed, including ranchers, public officials, planning commission members, and the citizenry-at-large expressed nearly unanimous support for keeping this area as is. Barring unforeseen events, this land will be incorporated into the final Comprehensive Plan with its present agricultural designation. Once the Comprehensive Plan is adopted, it will be extremely difficult to use this land for any purpose other than agricultural. Supporting this conclusion is the widely held feeling among area residents that new developments should be contiguous to already developed neighborhoods. For this reason the draft Comprehensive Plan limits most urban growth to the City of Steamboat Springs and adjacent areas between Mt. Werner and the town.

At this point, another factor should be considered. The existing site is in a section that could very well become densely populated. The land surrounding the present lagoons is slated for high intensity industrial development to the north and east on the 1995 plan and for medium density residental just to the west. A trailer park and housing development are already in operation on nearby property. The history of sewer systems in populated areas is not very good. People have an almost instinctive reaction against sewage, and there are practical fears of noise and odor. Interviews with residents of the nearby trailer park revealed no complaints about the present facilities, but one cannot be sure that future residents will feel the same, or that expanded facilities will not make a difference. Eventually, complaints from residents and businesses in the neighborhood could force the city to consider a new location.

In sum, there is little appreciable difference between the sites as far as their effect on growth patterns is concerned. For that reason, the existing site may be desirable for the short term in order to fully utilize present facilities, but over the long run the Midway Site is preferable since it provides adequate buffer away from nearby residences, thus consistent with sound land use principals.

Land use criteria must also be considered when land treatment is under consideration. Application of disinfected secondary effluent to a parcel of land requires the long-term commitment of that land for treatment purposes. The area proposed for summertime land treatment is shown in Figure 2, and is the same area that public officials, study area residents and property owners agree should remain agricultural. Land treatment would not only offer nutrient-laden irrigation water, but also help preserve the continued use of this land for agricultural purposes. This conforms to the CAC goal of enhancing the agricultural industry and is consistent with public opinion and proposed 1995 land use designations. Simultaneously, summertime land treatment, by keeping the direct discharge in winter, would,through the technology employed, link the waste-load allocation to a design population. Since the waste-load allocation is in pounds per day, with no credit given for the summertime when direct discharges are nonexistent, the wasteload allocation will continue to serve as a growth constraint and a growth management tool. Therefore, EPA encourages this mode of tertiary treatment for the Steamboat Springs area.

Costs

Table XXVI is the cost comparison prepared by Wright-McLaughlin. The capital costs for facility construction are lowest in the case of Alternative IV. Therefore, this approach is the most cost-effective for the federal government.

Upon examination of local share costs it is apparent that an anomoly exists. Although facilities built in 1977 will receive federal matching

TABLE XXVI

ALTERNATIVES COST COMPARISON

Alternative Designation No.		PRESENT WORTH VALUES			AMORTIZED VALUES			
		Total Capital Expenditures ($)	First Phase Collection ($)	First Phase Plant ($)	Capital 35 yr. Period ¢/1000 gal.	Capital 20 yr. Period ¢/1000 gal.	Operations and Maintenance ¢/1000 gal.	Loca Shar ¢/1000
1.	Steamboat E/A - ABT	3,811,592	899,195	2, 414, 514	34.9	44.0	26.9	37.9
2.	Steamboat E/A -M/AWT	4,042,704	899,195	2, 332, 171	37.1	46.6	21.9	33.6
3.	Midway E/A-ABT	3,673,911	1,086,585	1, 545, 891	33.7	42.4	26.9	37.5
4.	Midway E/A-M/AWT	3,652,622	1,086,585	1, 215, 973	33.5	42.1	21.9	32.4

funds through this grant, additional facilities needed around 1985 are not assured of these federal funds. As a result, the local share of facilities is greatest for Alternative IV when both short and long-term construction is considered.

However, to determine the net economic impact on the community, long-term (20 year) operation and maintenance (O & M) costs must be considered. Wright-McLaughlin prepared Table XXVI which compares O & M costs based on flow estimates for the year 2010. They have concluded that savings in long-term O & M via Alternative IV will more than compensate for a larger capital expenditure for facilities.

Chapter III is devoted entirely to the financial condition of the SSRSA entities. It is apparent that remedial measures must be taken to assure availability of sufficient local funds. Wright-McLaughlin has recommended consolidation of the six special districts with the water and sewer services of the city, KOA campground, and Sleepy Bear. However, no administrative plan has been developed for this purpose. EPA will require development of such a plan and corresponding demonstration of financial soundness before a detailed engineering (Step 2) grant can be approved. Although the city has begun efforts to prepare such a plan, uncertainties of local financing remains an unresolved issue of this draft EIS.

VII. Recommended Action

It is EPA policy that the selection of the engineering alternative be done at the local governmental level providing engineering economic and environmental criteria are met. This selection was made on April 8, 1976 by the Citizen's Adivsory Committee (CAC) and it was supported by city officials, the design engineer, the environmental consultant and the EPA. Based on this concurrance, the final design is being developed and several unresolved issues are being addressed.

The alternative chosen is the one designated as Alternative IV in this report. It provides tertiary treatment by summertime land application at a Midway site. The existing Steamboat Springs plant will be used for secondary treatment until retirement in 1985 (approx.). The collection system would use the Mt. Werner lagoon for flow leveling and would divert most of the wastewater to the Steamboat Springs plant. From here the treated effluent would be directed to the Midway plant for final treatment and processing. The installation of the collection system would be funded by the districts involved, except for improvements in I/I and the installation of outfalls. It would involve the improvement or replacement of several thousand feet of existing outfalls in the Mt. Werner and Steamboat Springs districts, plus the installation of a new outfall that would connect Steamboat Springs and Midway. This latter line would also receive wastewater from KOA, Sleepy Bear and Steamboat II.

The major components of the new plant would include a pre-treatment facility, two extended aeration basins, two clarifiers, dual media filters, disinfection facilities, sludge facilities and an aerated polishing pond. The extended aeration basins would provide for BOD removal and some nitrification (25 to 50 percent). Additional BOD would be removed by the dual media filter, which would also remove suspended solids. The aerated pond would then provide additional treatment and flow leveling. Acceptable dechlorination facilities have not incorporated into this design but they will be before publication of the final EIS. Such facilities are necessary during the non-irrigation season when the effluent is discharged into the Yampa River.

During the irrigation season the incoming wastewater would be treated and disinfected before being applied to the land. The in-plant treatment would consist of primary and secondary treatment although some tertiary treatment would also occur (nitrification). The application of effluent to the land would provide the majority of the tertiary treatment, and it would probably be applied to the valley bottomlands near the Midway. The application rate would be at least three acre-feet per acre per year and possibly as high as seven. This rate would be hydraulic limited for all lands until 1985, but it could become nitrate limited by 2010 for the valley bottom lands. Crops would be planted on the irrigated lands and they would be selected to accomodate the nitrate loading of the effluent.

Sludge would be generated by the in-plant process and it, too, would be applied to the land. It would contain one to two percent solids and would be applied on a year-round basis. Crops would again be planted on the irrigated lands and would be selected according to their nitrogen uptake rates. The application method could be by flood or spray irrigation, as well as by trucking and dumping into trenches. Spray irrigation is not recommended due to dispersal of aerosols which could contain pathogens and viruses. The application rate would be comparable to the effluent rates and would vary between three and seven acre-feet per acre per year.

The exact location of the plant or the land treatment area has not been determined. These locations will be selected before the publication of the final EIS.

The construction phasing is planned in two stages, one commencing in 1977, the other in 1985. The first phase would provide for the installation of all equipment previously mentioned. The second phase would provide for two more aerators, two additional clarifiers and a second pond. Their completion and successful operation would signal the retirement of the existing plant at Steamboat Springs. Phase II operation involves higher annual power costs since not only will there be increased flows but will primarily be due to energy consuming aerators which will replace the lagoons at the Steamboat Springs site.

VIII. Mitigation Measures

The proposed mitigation measures are discussed in the text that follows. They are designed to minimize the projected impacts that are delineated in Capter VI, Evaluation of the Alternatives. They are discussed under the headings of water quantity, water quality, soils, biology, air quality, history and archaeology, and socio-economics.

Water Quantity

The most significant water quantity problem facing the SSRSA is the excessive inflow/infiltration (I/I) within their collection systems. This factor often accounts for up to 85 percent of the total flow at the Steamboat Springs plant. To minimize this action the Public Works Department of Steamboat Springs is initiating two programs. One replaces some of the lines in the older part of the city and places them below the frost line. Another installs metering devices to encourage conservation of water. Through these activities the city hopes to reduce inflow from winter bleeding by about 50 percent, which would reduce winter I/I by over 20 percent.

Additional measures are proposed by Wright-McLaughlin Engineers so that year-round I/I can be reduced by approximately 50 percent. They would involve replacing some of the older lines in Steamboat Springs with the new ones paralleling the older ones. Such action would allow the older lines to continue to collect groundwaters and discharge it to the Yampa River drainage. If this technique is employed, the discharge should be integrated into plans to control urban runoff. It could require some settling to remove suspended solids or possibly some other form of treatment. Tests on the quality of this water would be necessary to determine the necessary control or treatment. The discharge, itself, would require a permit from the Colorado Water Quality Control Division.

After proper controls have been placed on discharging some of the I/I, it should be considered for recycling purposes. This possibility would depend on its water quality and the needs of potential users.

Other means of controlling I/I have been proposed for the Mt. Werner collection system, which would consist of replacing existing pipe, grouting it and providing liners. These proposals, along with the others, are considered cost effective by Wright-McLaughlin Engineers when compared with facilities expansions. Consequently, the engineers have assumed that their proposals will be implemented and they have designed the future facilities accordingly.

Water Quality

The water quality of the Yampa River can be maintained and improved by implementing the recommended action, by controlling and treating urban and agricultural runoff, and by stabilizing the river banks. All of these factors are necessary if the 1983 goal of the Water Pollution Control Act is to be achieved. An important corollary to the recommended action is sound and alert management of the proposed system. This factor would be especially important during the irrigation season when application rates must be properly adjusted to account for aerobic soil conditions and proper treatment before discharge into the Yampa River. This latter consideration will require periodic monitoring of the discharge to see if it complies with permit requirements. Another consideration would be the quality of the receiving waters in the ground. Again, periodic monitoring would enable management to regularly assess this parameter and take corrective action if necessary.

During the non-irrigation period it would be necessary to regularly monitor the quality of the effluent and helpful to monitor the sludge. Parameters of concern include ammonia, residual chlorine, BOD and suspended solids; the effluent concentrations must conform to a discharge permit while sludge concentrations do not. However, the constituents in the sludge will impact the application site so their quality should also be known. Such information would be helpful in finding the optimum application rate or the optimum application method.

Besides improving the sewage facilities, additional work is necessary to deter bank erosion, agricultural runoff and urban runoff. The control of bank erosion is largely the responsibility of the land owners adjacent to the Yampa River. However, encouragement and support by Routt County officials could provide an impetus for the necessary improvements. The control of agricultural runoff is also the primary responsibility of the landowner, yet the County and Soil Conservation Service could provide some helpful advice or assistance. The control of urban runoff is more of a city problem and at the printing of this report, remains an unresolved issue. The design engineer has stated that their proposed facilities could incorporate such controls into their design; yet, the details of such a plan are not formulated nor is it known who would pay for it.

Soils

The soils of the project area will be impacted due to irrigation with effluent, application with sludge and construction of new facilities. The application of effluent and sludge should impart a beneficial effect to the soils if distribution rates are controlled. The construction of the new facilities will provide local conditions for erosion. When the foundations are laid, they should be performed during the drier periods of the year to mitigate against the loss of top soils. These soils will be valuable during the revegetation phases of the project.

Biology

The biological systems most effected by the project are the Yampa River, proposed irrigation and sludge disposal sites, and the construction site. The means of mitigating impacts on the Yampa River and the farmlands have already been discussed. The means of mitigating the impact on the construction site is to implement an effective revegetation program. Topsoil should be saved during grading, if possible, and stockpiled for later distribution. Seeding should be done preceding the first growing season and should be supplemented with fertilizer and irrigation. An attempt should be made to accomplish this with the naturally-fertilized effluent. The initial planting should be with annuals, to be followed by perennials, once establishment becomes evident. Consultation with the local Soil Conservation and the University of Colorado Extension Service could be helpful in determining the most suitable species to plant.

Air Quality

The most significant problem with the quality of the project's air is the generation of fugitive dust from automobiles and trucks. This problem can be mitigated by a more effective street cleaning program, which is proposed to reduce the pollution loads from urban runoff.

History and Archaeology

If archaeological artifacts are discovered during construction or plowing activities, these activities should be stopped. A qualified archaeologist should then be summoned to investigate the site. If the findings are significant, accommodations should be made to allow proper excavation and assessment. However, these accommodations should be done in such a manner that construction delays are minimized.

Socio-Economics

The main socio-economic factor to be mitigated is the poor financial conditions of the districts. This condition is discussed in Chapter III and it must be rectified before construction funds can be released. The EPA must be assured that the member districts can produce their 25 percent of the total projected cost.

Conclusion

Implementation of many of the detailed mitagating measures will depend upon subsequent approval of the final version of the engineer's Facility Plan. This plan will analyze what is cost-effective for the SSRSA and the details of soil replacement, revegetation, and land application operation, etc. In addition, comments received as a result of reviewing this draft EIS recommending additional mitigating measures will be incorporated into the design of this treatment plant if possible. The final EIS will detail the mitigating measures that will be implemented as a result of agency and public review.

IX. Unavoidable Adverse Effects

After the impacts of the recommended action are mitigated, the remaining impacts are considered unavoidable. Most of these impacts are on the area's water quality and they are considered minor. They include increases in background levels of BOD, nitrogen and residual chlorines in the Yampa River. The BOD represents organic material that can be consumed by aquatic insects or that can be decomposed into nutrients. These nutrients could produce a fertilizing effect on the plants of the Yampa River, thus improving its productivity. The nitrogen compounds would include ammonia and nitrates, and they could also provide a fertilizing effect on the Yampa River. Both BOD and ammonia could reduce the river's oxygen concentrations although this is expected to be slight.

Other unavoidable impacts include the loss of approximately 20 acres of productive cropland due to the construction of the new plant. Impacts associated with the land application program are expected to be beneficial, and its potential adverse impacts should be avoidable through proper application rates and proper management.

X. Short-Term Uses and Long-Term Productivity

The short-term uses of the study area are centered around cattle ranching and skiing. The proposed facilities plan provides support for these industries and strives to do it in an environmentally sound manner. It should benefit the productivity of local croplands if effluent and sludge are properly applied to them. However, when the effluent is discharged into the Yampa River, some degradation in water quality could result, even though it would represent an improvement over existing conditions. These effluents could also improve the productivity of the river's ecosystem, by fertilizing with organics, ammonia and nitrate.

After 20 or 30 years, the productivity of the area's croplands could still be enhanced by the application of sewage wastes. However, the productivity of the Yampa River could deteriorate if other sources of pollution are not checked. These sources include urban and agricultural runoff, plus river bank erosion. All of these sources affect the short-term productivity of the Yampa although they could degrade it even more in the future. Urban runoff should increase more than the others and special considerations should be given to its control and treatment. The output of agricultural runoff, should be relatively constant unless new techniques can be developed to reduce it. The overall impact could be a long-term reduction in aquatic productivity.

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XI. Irreversible and Irretrievable Commitment of Resources

Despite the improvements in environmental quality that the recommended action would provide, certain resources would be required to implement it. These resources would include raw materials to build the plant and its distribution system: steel, concrete, plastic, glass, etc. Most of this material would represent an irreversible and irretrievable commitment of resources although future improvements in recycling technology could enable some of it to be reclaimed and reused. Other resources would include various types of energy, necessary to build and operate the system. These resources would be irretrievable once they are used. During the operation of the system, the energy costs would represent about 48 percent of the total operational costs. Other costs are listed in Table XXVII and include costs for labor, repairs and chemicals. The total outlay for 1985 is projected to be $102,097 and for 2010, $192,121.

The land would represent another resource committed to the project. Those lands under irrigation would be committed for the duration of the project, after which they could be returned to their current use. However, the quality of these lands could be irreversibly altered by the proposed irrigation practices, even though this is expected to be beneficial. Those lands used by the plant should not be irreversibly committed since future reclamation activities could restore most of their productivity.

TABLE XXVII

Average Annual Operating Costs (1976 dollars)

	For Phase I by 1985		For Phase II by 2010
Labor	$31,856		$59,576
Chemicals	11,523		14,855
Repair and Replacement	10,916		28,854
Power	49,932	@2¢/kwh	92,856
Land Treatment Credit (sale of crops)	-2,130		-4,020
Total	$102,097		$192,121

The condition of the Yampa River will be altered by the increased sewage load to be discharged into it. This change could be beneficial if the discharged nutrients promote an increase in the river's productivity. However, future changes in sewage treatment could alter these conditions so it is only irreversible throughout the lifetime of the proposed facilities.

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Appendix A

Water Quality Standards and Regulations

TABLE I

STREAM QUALITY DESIGNATION

Standard	Meaning
A1, A2, B1, B2	Suitable as a raw water supply treatable to drinking water standards
A1, B1	Cold water fishery (DO = 6 mg/l, Temp. 68° F)
A2, B2	Warm water fishery (DO = 5 mg/l, Temp. 90°F)
A1, A2	Suitable for all purposes for which raw water is customarily used including primary contact recreation (Fecal Coli = 200/100 ml, pH = 6.5-8.5)
B1, B2	Suitable for all purposes for which raw water is customarily used except primary contact recreation (Fecal Coli = 1000/100 ml, pH = 6-9).

TABLE II

COLORADO STANDARDS FOR THE DISCHARGE OF WASTES

Parameter	Parameter Limitation, Effective August 21, 1975	
	7-Day Average	30-Day Average
BOD_5	45 mg/l	30 mg/l
Suspended Solid	45 mg/l	30 mg/l
Fecal Coliform	As determined by the Division of Administration of the State Health Department to protect public health in the stream classification to which the discharge is made.	
Residual Chlorine	Less than 0.5 mg/l	
pH	6.0 - 9.0	
Oil and Grease	10 mg/l and there shall be no visible sheen.	

TABLE III

ROUTT COUNTY STANDARDS FOR DISCHARGE OF WASTES
(Summary)

Parameter	Parameter Limitation Effective:		
	July 11, 1973	July 1, 1975	July 1, 1978
BOD_5	30 mg/l	25 mg/l	10 mg/l
Suspended Solids	30 mg/l	25 mg/l	20 mg/l
Fecal Coliform (to Class B_3 stream)	500/100 mls	500/100 mls	500/100 mls
Residual Chlorine	Not less than 0.1 mg/l and not more than 0.5 mg/l.		
pH	Applicable Water Quality Standards (6.0 - 9.0)		
Oil and Grease	10 mg/l	10 mg/l	10 mg/l

TABLE V

STEAMBOAT SPRINGS REGIONAL SERVICES AUTHORITY EFFLUENT LIMITATION CRITERIA(1)

CONSTITUENT	RAW WATER SUPPLY	NATURAL BACKGROUND LEVEL	2010 TREATMENT PLANT INFLUENT(2)	EFFLUENT LIMITATIONS			RATIONALE (CONTROLLING USE)
				1978	1983	1985	
		MAJOR CRITERIA					
OXYGEN DEMAND							
Biochemical Oxygen Demand		3.06 mg/l	168 mg/ (5432#)	10 mg/l (238 #)	10 mg/l (238 #)	5 mg/l	EPA requires minimum 85% removal. Discharge permit limit of 238 lbs/day. County resolution limit of 10 mg/l for 1978. Permit limit controls effluent quality to less than 10 mg/l for first phase construction. Non-point pollutants are additional. 5 ppm limitation for 1985 compatible with background level and future population loads.
Chemical Oxygen Demand			219 mg/l (7086#)		20 mg/l	10 mg/l	Compatible with BOD removal. Lower COD desirable
Dissolved Oxygen		8.9 mg/l		6 mg/l min.	6 mg/l min	6 mg/l min	Minimum for cold water fishery. Stream standards and antidegradation statements required.
SOLIDS							
Suspended Solids			146 mg/l (4724#)	20 mg/l	10 mg/l	5 mg/l	EPA requires minimum 85% removal. County resolution limit of 20 mg/l for 1978. 1983 and 1985 standards compatible with BOD removal. 1985 limitation agrees with NDCP.
Settleable Solids				.5 mg/l	Free From	Free From	1978 limitations based on State, County standards, 1983 and 1985 agrees with stream standards and NDCP.
Total Dissolved Solids		471 mg/l			500 - 1,000 mg/l	500 - 1,000 mg/l	TDS not critical. Major sources of TDS are area hot springs. Parameter involved with ammonia.
PHYSICAL/CHEMICAL PARAMETER							
Temperature				20° C maximum	± 1°C of ambient		Stream standards require, critical parameter involved with ammonia.
pH	6.9	8.3		6 - 9	6.5 - 8.5	6.5 - 8.5	Stream standards require, critical parameter involved with ammonia. 1983 and 1985 values necessary for NDCP, aquatic life and recreation waters.
Turbidity		28 JTU		20 JTU	10% change in C.P.		1978 values based on Colorado and County standards, 1983 and 1985 values for aquatic life.
Color					Free From	Free From	Stream standards.
Alkalinity	22.2 mg/l					30 - 130 mg/l	Fresh water wildlife.
Chlorine				.1-.5mg/l	.025 mg/l	.025 mg/l	1983 and 1985 value based on no decay loss in mixing and maximum .002 mg/l concentration for acquatic life. See text.
MICROORGANISM							
Fecal Coliform		255/100 ml 70.6/100 ml		200/100 ml	200/100 ml	200/100 ml	EPA Standards.
..ruses							Goal is absence of viruses. No test data, but currently in effluent.
ORGANICS							
Pesticides					.01 96 HR LC 50	.01 96 HR LC 50	Aquatic Life.
Phenols					.005 mg/l	.001 mg/l	Fresh water public supply, 1983 based on assimilative capacity, 1985 NDCP.
Oils & Greases					.05 96 HR LD 50	.05 96 HR LD 50	Aquatic life, stream standards require no visible oil.
MACRO NUTRIENTS							
Ammonia N (NH_3-N)		.07 mg/l	10 mg/l (354#)	Varies Monthly 2-9mg/l	Varies Monthly 2-9 mg/l	Varies Monthly 0.5-9 mg/l	1978 and 1983 limitations vary according to monthly low flow, temperature, PH, and TDS. 1985 values use extreme values of temperature, TDS and background level to insure very low probability of toxic conditions to acquatic life. See text for monthly values.

(1) Prepared by Wright-McLaughlin Engineers, April, 1976.
(2) Assuming a 25% reduction in excess infiltration and inflow.

TABLE V (con't)

STEAMBOAT SPRINGS REGIONAL SERVICES AUTHORITY
EFFLUENT LIMITATION CRITERIA

CONSTITUENT	RAW WATER SUPPLY	NATURAL BACKGROUND LEVEL	2010 TREATMENT PLANT INFLUENT(3)	EFFLUENT LIMITATIONS			RATIONALE (CONTROLLING USE)
				1978	1983	1985	
MINOR CRITERIA							
MACRO NUTRIENTS							
Total Nitrogen			14 mg/l (472#)	10 mg/l	10 mg/l	10 mg/l	As nitrates must be limited, Total N cannot be appreciably greater, also see text.
Organic N							Limitation involved with Total Nitrogen limitation, normal processes convert organic to other nitrogen forms.
Nitrate N	.6 mg/l	.26 mg/l			< 9.0 mg/l	< 9.0 mg/l	Drinking water standards.
Phosphorous		.07 mg/l	7 mg/l (236#)	5 mg/l	5 mg/l	5 mg/l	Limitations based on dilution by streamflow that give reliable levels to maintain recreation waters. See text.
Potassium		.17 mg/l				.15 mg/l	NDCP, based on background level.
Sulfur (Sulfides)				.01 mg/l	.002 mg/l	.002 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.(1)
Calcium	5.7 mg/l	110 mg/l					See alkalinity.
Magnesium	2.7 mg/l	127 mg/l					See alkalinity.
MICRO NUTRIENTS							
Iron		.19 mg/l			1.5 mg/l	.3 mg/l	Fresh water public water supply, aquatic life, 1983 based on assimulative capacity
Manganese					.25 mg/l	.05 mg/l	Fresh water supply, aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Boron		.041 mg/l			5 mg/l	1 mg/l	Fresh water public water supply, irrigation, 1983 based on assimulative capacity, 1985 NDCP.
Zinc					.015 96 HR LC 50(2)	.003 96 HR LC 50	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Copper					.5 96 HR LC 50	0.1 96 HR LC 50	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP, also for Livestock drinking water.
Molybdenum					.05 mg/l	.01 mg/l	Limit for irrigation water, 1983 based on assimulative capacity, 1985 NDCP.
METALS							
Aluminum						5 mg/l	1985 limitation for agricultural
Lead	> .01 mg/l				.15 mg/l	.03 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Mercury	> .1 mg/l				.001 mg/l	.0002 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP
Chromium					.15 mg/l	.03 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Cadmium	> .01 mg/l				.02 mg/l	.004 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Nickel					.1 mg/l	.02 mg/l	Aquatic life, 1983 based on assimulative capacity, 1985 NDCP.
Sodium	2.4 mg/l	8.7					See alkalinity.

(1) NDCP No Discharge of Critical Pollutants.

(2) 96 HR LC50 Median Lethal Concentration - Concentration causes death to 50% of a population within 96 hours.

(3) Assuming a 25% reduction in excess infiltration and inflow.

TABLE IV

DISCHARGE PERMIT REQUIREMENTS *
for
SLEEPY BEAR (SB), STEAMBOAT SPRINGS (SS), MT. WERNER (MW), STEAMBOAT II (S2)

PARAMETER	AGENCY	Monitoring Schedule		Average Effluent Concentration		
		FREQUENCY	SAMPLE-TYPE	30 CONSECUTIVE DAY PERIOD	7 CONSECUTIVE DAY PERIOD	DAILY
Total Flow	SB	Monthly	Instantaneous			
	SS	Weekly	Total			
	MW	Weekly	Continuous			
	SZ	Weekly	Instantaneous			
Total BOD_5 mg/l	SB	Monthly	Grab	30	45	N/A
	SS	Quarterly	Composite	30	45	60
	MW	Quarterly	Grab	30	45	N/A
	SZ	Monthly	Grab	30	45	N/A
Total Suspended Solids mg/l	SB	Monthly	Grab	30	45	N/A
	SS	Quarterly	Composite	30	45	60
	MW	Quarterly	Grab	30	45	N/A
	SZ	Monthly	Grab	30	45	
Fecal Coliform no./100 ml	SB	Monthly	Grab	200	400	N/A
	SS	Quarterly	Grab	200	400	N/A
	MW	Quarterly	Grab	200	400	N/A
	SZ	Monthly	Grab	1000	1500	
pH Units	SB	Monthly	Grab	shall remain between 6.0 - 9.0		
	SS	Weekly	Grab	shall remain between 6.5 - 8.5		
	MW	Weekly	Grab	shall remain between 6.0 - 9.0		
	SZ	Weekly	Grab	shall remain between 6.0 - 9.0		
Total Residual Chlorine mg/l	SB	Weekly	Grab	N/A	0.5	N/A
	SS	Daily	Grab	N/A	N/A	0.5
	MW	N/A	N/A	N/A	0.5	N/A
	SZ	Weekly	Grab		0.5	
Total BOD_5 lbs./day	SB			3.0	(effective as soon as reasonable & practical, but not later than Sept. 1, 1976)	
	SS			181	(effective as soon as reasonable & practical, but not later than July 1, 1977)	
	MW	Quarterly	Grab	37	(effective immediately)	
	SZ	Monthly		13.64	(effective after July 1, 1977)	
Oil and Grease	SB			shall not exceed 10mg/l in any grab & no visible sheen		
	SS					10.0
	MW				10.0	
	SZ				10.0	

*SOURCE:
EPA "Authorization to Discharge Under the National Pollutant Discharge Elimination System."

APPENDIX B

Waste Treatment Process Review

The formal Section 201 Facilities Planning effort requires the development and evaluation of various alternative wastewater treatment schemes. These various alternative treatment-schemes consist of different combinations of sewage treatment processes, which can be considered interconnected elements with a different function. In order to better understand these various functions, a brief review of treatment goals is discussed in the text that follows. The organization includes the following sections: the identification and subsequent definition of the most significant pollutants in the SSRSA study area, a description of the different levels of treatment, and a description of currently accepted methods of sludge treatment and sludge disposal.

Significant pollutants in the SSRSA wastewaters: Wastewater differs from high quality waters by the presence of one or more constituents, which are undesirable due to health factors, aesthetics or physical, chemical, and biological factors. These factors can be identified as those constituents that tend to degrade the useful and aesthetics characteristics of the water medium. In the Steamboat Springs Regional Services Authority area the four major parameters of concern are biochemical oxygen demand, inorganic and organic suspended solids, ammonia-nitrogen and pathogenic organisms. Because of the significance of these parameters to overall wastewater quality and to any associated wastewater treatment facility, a working definition of each is provided next.

The biochemical oxygen demand (BOD) of domestic wastewaters is the amount of oxygen required to stablize organic matter present in water via biological action. The BOD test is among the most important made in the wastewater analysis since the direct effect of BOD is a decrease in dissolved oxygen in the water. The maintenance of minimum oxygen levels is required to support stream fisheries and associated aquatic life, so the level of BOD has significant implications for overall biological productivity.

Municipal wastewater also contains significant quantities of both inorganic and organic suspended solids (SS). These solids are important in at least two respects. First, approximately 25 to 40 percent of the biochemical oxygen demand is associated with suspended solids; therefore, if the SS are removed then a significant percentage of BOD is also removed. Second, solids create turbidity, and can settle out, creating sludge banks in receiving streambeds, and also cause odors and reduce biological productivity.

Ammonia-nitrogen is present in domestic wastewaters due to the biological breakdown of protein. Its significance in the SSRSA study area is that the un-ionized form of this parameter is highly toxic to fish. Since the maintenance of a high quality fishery is a stated goal of Routt County, the CAC, the State of Colorado and of the 1972 Water Pollution Control Act as Amended, an extensive investigation of this parameter was conducted by the design engineer. Advanced treatment for ammonia removal will be required in the Steamboat Springs area to protect and enhance the Yampa River fishery. Land application as tertiary treatment uses the ammonia which is a very valuable nutrient; a nitrate fertilizer.

Pathogenic Organisms: Pathogenic organisms measured by fecal coliforms as indicators, consist basically of bacteria and viruses from human wastes, which are a health hazard to downstream water users. Therefore, their destruction or removal is necessary from an overall public health point of view.

Alternate Treatment Processes: There are three basic levels of waste treatment that can be attained via different combinations of treatment processes; these basic treatment levels include primary treatment, secondary treatment and advanced or tertiary treatment. The significance of each of these treatment levels and the engineering processes used to attain them are presented below.

Primary treatment is normally employed for the removal of floating materials or large suspended solids, which also prepares the wastewater for the next treatment process. The mechanism for acheiving primary treatment is usually physical in nature and is initiated by a pre-treatment process. Pre-treatment provides for the removal of large materials, such as rags and paper, etc. which could damage pumps, plug lines or otherwise interfere with the satisfactory operation of the equipment. Heavy inorganic grit such as sand and gravel, which also lead to similar operations and maintenance problems throughout the plant, are also removed via the preliminary treatment apparatus. This apparatus generally consists of combinations of coarse screens, grinding and small settling chambers.

The primary treatment follows and is accomplished by gravity settling via a large settling tank or clarifier, which removes some suspended solids and biological oxygen demand. The settleable solids represent 50 to 65 percent of the total suspended matter and 25 to 40 percent of the BOD. Removal of the BOD in the primary settling tanks reduces the loading of the subsequent treatment units. Primary sludge collected at the bottom of the clarifier is usually disposed of via anaerobic rather than aerobic digestion due to a superior pathogen removal.

Secondary treatment is the next treatment process; its purpose is to convert dissolved and suspended organic matter (BOD) to harmless gases, water and settleable solids via biological processes. Disinfection is also generally considered a secondary treatment process. The two most frequently used biological processes are the trickling filter and the activated sludge system.

The basic trickling filter consists of a circular concrete or steel structure packed with filter medium, which is usually crushed rock or synthetic materials. Wastewater is uniformly applied to the media by means of a rotating distributor and is collected and discharged at the bottom. Microorganisms grow as a slime layer on the rock media and consume the organic material in the wastewater. As the slime layer grows, it periodically breaks off and is conveyed via the water stream to a secondary clarifier. This clarifier settles out suspended material that has sloughed off the filter medium. The effluent is then recycled through the filter in an effort to improve the overall effluent quality.

The advantage of trickling filters is their simplicity of operation and low sludge production. The main disadvantage is lower removal efficiencies and occasional odor problems. When cold ambient temperatures slow down the rate of biological activity, the removal efficiencies are reduced even more. The other type of secondary treatment is one of several types of processes, collectively called activated sludge. Although varying in detail, all these processes mix influent waste streams with biological floc in an aerated tank. The system consists of one or more aeration basins where air (or oxygen) is introduced by means of mechanical aerators (or diffusers). This aeration provides the oxygen to the microorganisms and maintains a properly mixed system. The aeration basins are followed in series by secondary clarifiers or sedimentation basins, where suspended microorganisms are settled out. A portion of these organisms are returned to the aeration basin to be mixed with new wastes; the excess organisms constitute waste sludge from the system and are sent to the sludge handling facilities. The conventional activated sludge system has a residence time in the aeration basin of five to eight hours. An extended aeration process as is proposed for the Steamboat Springs area utilizes a lower organic loading rate and uses a 18 to 24 hour retention time in the aeration basin. Primary clarification is generally not provided at the front of an extended aeration process. The longer residence time offers greater resistance to upset and less exacting requirements for operation control. BOD removals in the range of 85-95 percent should be achieved in activiated sludge-extended aeration secondary treatment processes.

Pathogen reduction is accomplished by chlorination after secondary treatment has been completed. The success of this process is generally measured in terms of a fecal coliform count, or the number of coliforms per 100 ml. Current Colorado Discharge Standards require a reduction of fecal coliform counts to less than 200 per 100ml.

An alternative process to the extended aeration method is the rotating Bio-Disc, whose application to date is probably more extensive in Europe than in U.S. This process consists of a series of large diameter plastic discs that are mounted on a horizontal shaft and placed in a contoured concrete tank. The discs are slowly rotated while approximately 40 percent of their surface area is immersed in the wastewater. Microorganisms adhere to the rotating surfaces in a fashion similar to that of the trickling filter. During rotation, the discs pick up a thin film of wastewater which flows down the surface and absorbs oxygen from the air. The microorganisms then consume the organic constituents from the thin film. A secondary clarifier is then required to remove material sloughed off the disc surface; however, recycling of this effluent is not required. Primary treatment is usually provided ahead of the Bio-Disc unit, creating a need for anerobic digestion. BOD removals are comparable to that achieved with an activated sludge system, although more temperature sensitive.

Until recently, the accepted practice in municipal wastewater processing has been secondary treatment, resulting in approximately 90 percent BOD reduction. With the advent of PL 92-500, however, it has become necessary to remove greater quantities of nitrogen, phosphorus, BOD and suspended solids. In the SSRSA study area, the principal constituents of concern are SS, BOD and ammonia-nitrogen. The additional removal of these parameters can be achieved in two ways, by in-plant treatment or land treatment.

An in-plant advanced treatment scheme for Steamboat would consist of the nitrification of ammonia, i.e. conversion to nitrate-nitrogen. This would be followed by filtration for suspended solids and BOD. Conventional biological nitrification is similar to the activated sludge system except a different type of microorganisms are maintained for the process. Both the Bio-Disc and trickling filter processes can be used for the nitrification step. With the Bio-Disc system an intermediate secondary clarification step is not required.

The nitrification process is temperature dependent so the colder winter temperatures at Steamboat Springs will reduce its efficiency of conversion. This characteristic makes it more difficult to start and maintain, which would require increased operator attention.

The applicability of land treatment to a certain region depends on many factors. Some of the more significant considerations are as follows:

> Climate--Warm-to-arid climates permit longer season application, but more severe climates are acceptable if adequate storage is provided for wet or freezing conditions.
>
> Topography--slopes up to 15 percent for crop irrigation are acceptable if runoff or erosion is controlled.
>
> Soil type--loamy soils are preferable, but most soils from sandy loams to clay loams are suitable.

Soil drainage--well-drained soil is preferable, however, more poorly drained soils may be suitable if drainage features are included in the design.

Soil depth--A uniform depth of 5 to 6 feet (1.52 to 1.83 m) or more throughout sites is usually necessary for root development and wastewater renovation.

Geologic formations--Lack of discontinuities that provide short circuits to the groundwater is necessary.

Groundwater--A minimum depth of 5 feet (1.53 m) to ground water is normally necessary to maintain aerobic conditions, provide necessary renovation, and prevent surface waterlogging. Control may be obtained by underdrains or groundwater pumping.

These are not hard and fast requirements but they emphasize the need for consultation with soil and agricultural specialists during the design phases.

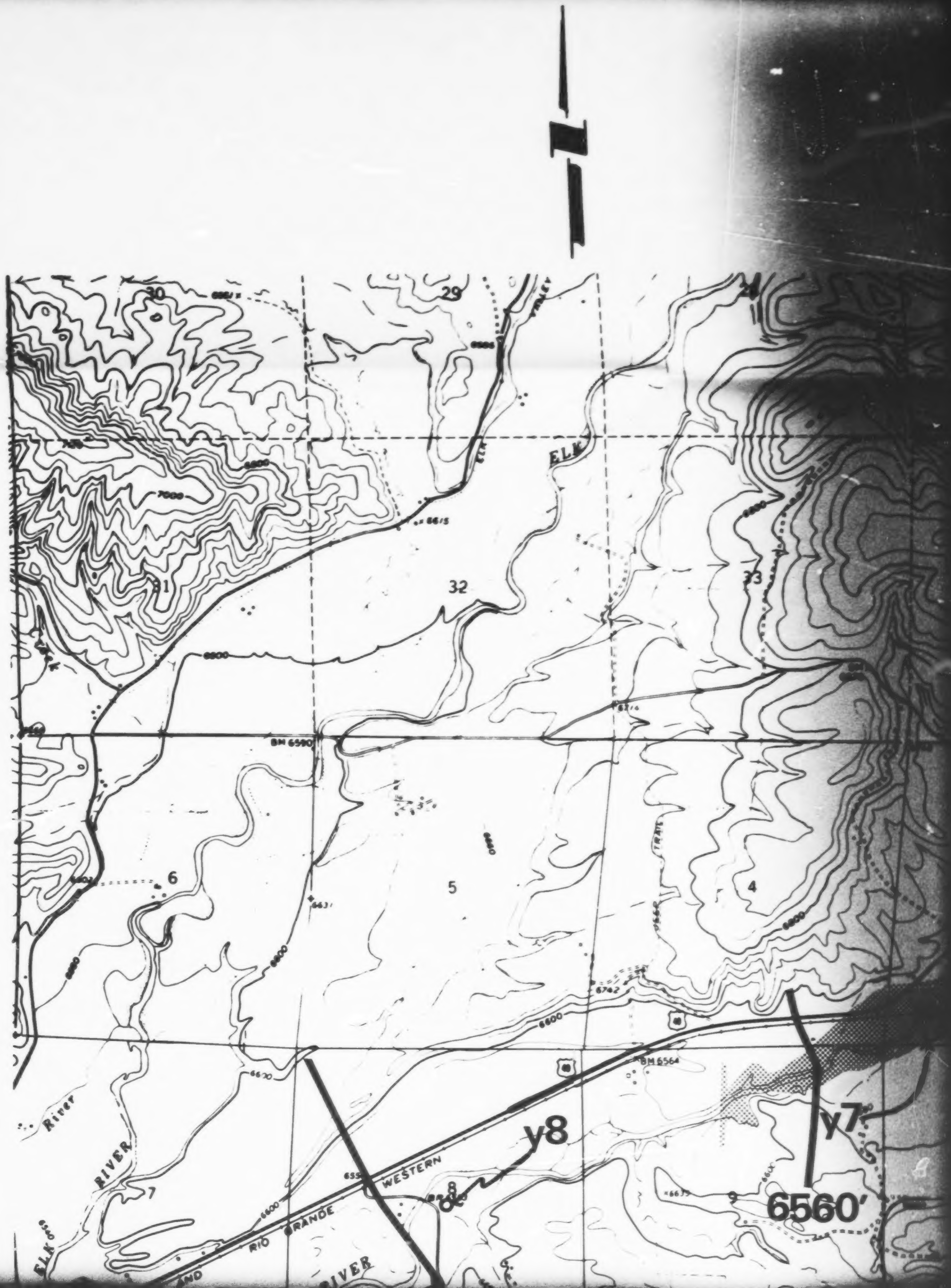
The most significant positive aspect of a land treatment system is that it represents the utilization of an available resource. The available nitrogen and phosphate in the wastewater would eliminate or reduce the need for chemical fertilizers. However, a successful land treatment operation will require constant effort, in the form of communication and cooperation between the municipality and the participating farmers.

Sludge Treatment and Disposal: Most of the treatment processes in the water pollution control field yield a sludge from either a settling process, a biological reaction, a filtration process or combinations of these. The solids undergo a series of treatment steps involving digestion, thickening and dewatering, prior to ultimate disposal.

Digestion is the process by which the organic fraction of the primary or wasted sludge is decomposed prior to final disposal. Both the anaerobic digestion (without oxygen) and the aerobic digestion (with oxygen) processes are applicable to typical wastewater sludges. Anaerobic digestion is probably more effective in reducing pathogen content and is sometimes required for certain primary sludges; however, it is fairly susceptible to upset conditions. Aerobic digesters are easier to operate and exhibit a lower capital cost, although they require higher operating costs due to supplying the required oxygen.

The dewatering of sludge reduces the moisture content of the digested sludge. When this content can be reduced by a factor of two to three, the cost of the ultimate disposal is greatly reduced through reduction in both weight and volume. Mechanical dewatering is usually achieved via vacuum filtration or centrifugation. Vacuum filtration uses a vacuum to pull or suck the moisture from the sludges. The centrifuge, on the other hand, concentrates sludges on the outside of a rotating unit, due to the centrifugal forces created by high rotating speeds. Depending on the nature of the sludges, the dewatering step could be preceded by sludge conditioning with the addition of chemicals such as lime or organic polyelectrolytes.

In the land application option, the thickened and digested sludges would be used for their nutrient content near the treatment plant site. The nitrogen, phosphates, trace elements, and organic matter contained in the sludge are then utilized for plant growth and subsequent crop production. The presence of nitrogen and trace metals would determine the loading rates to be applied.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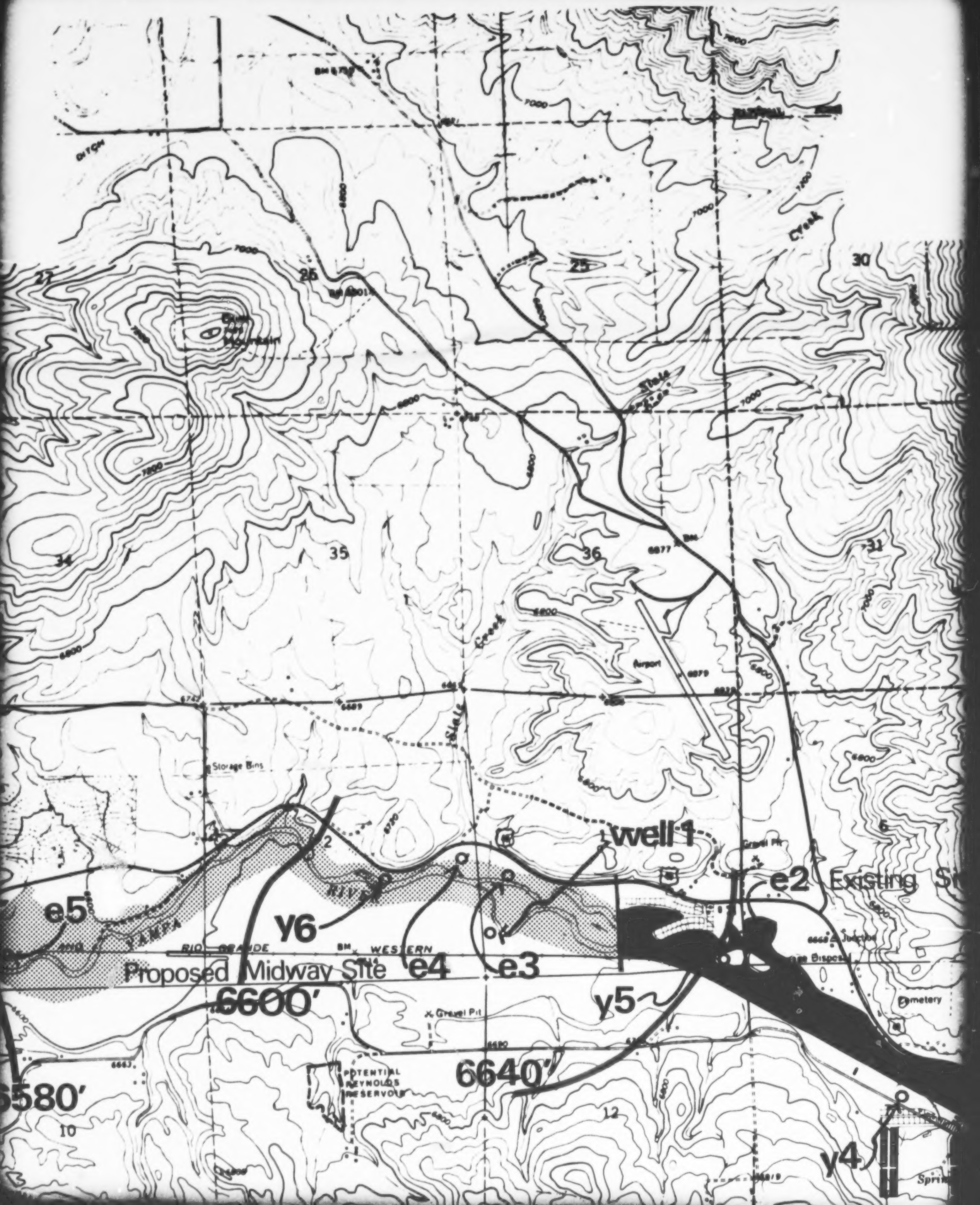

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Airport
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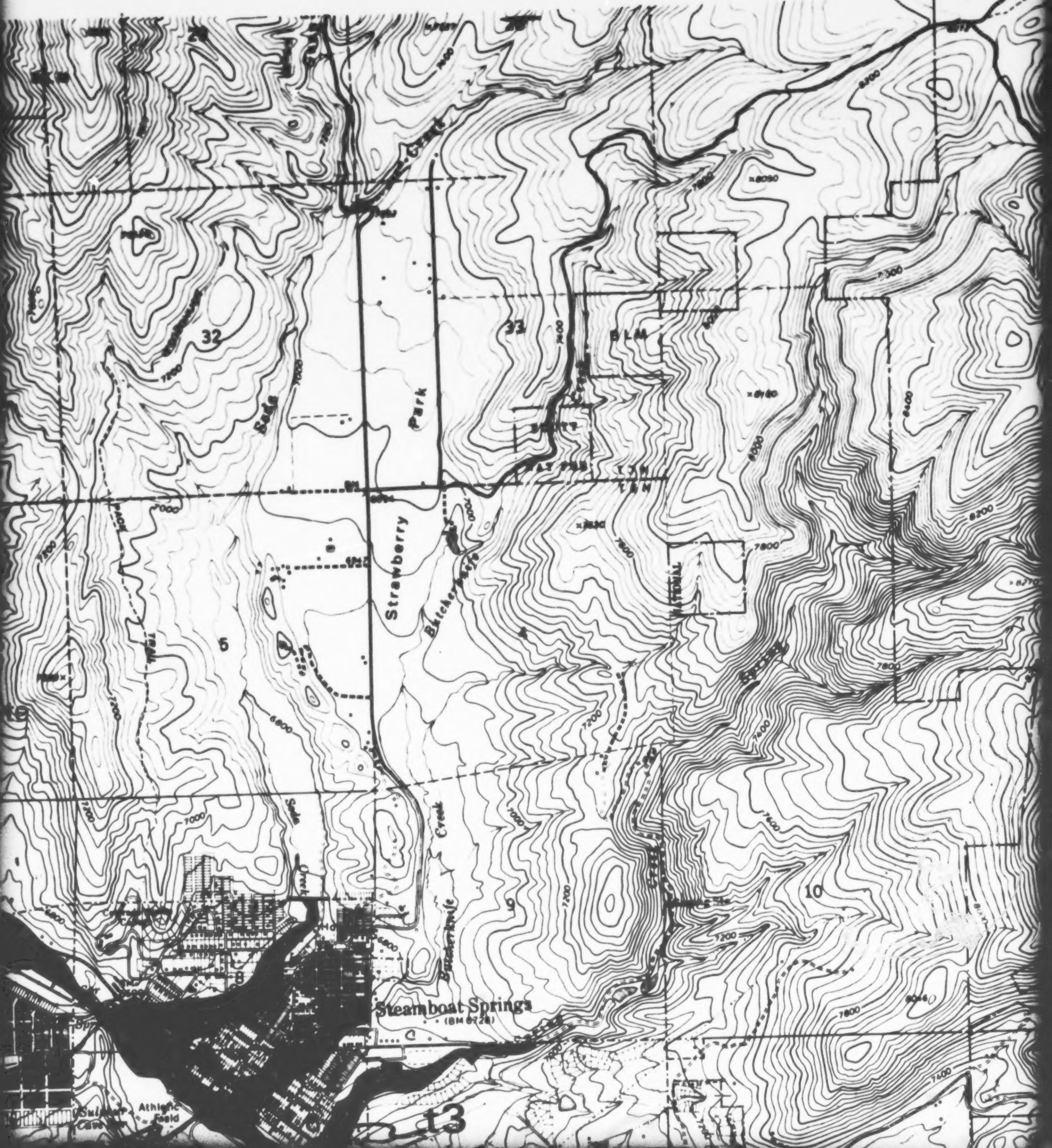
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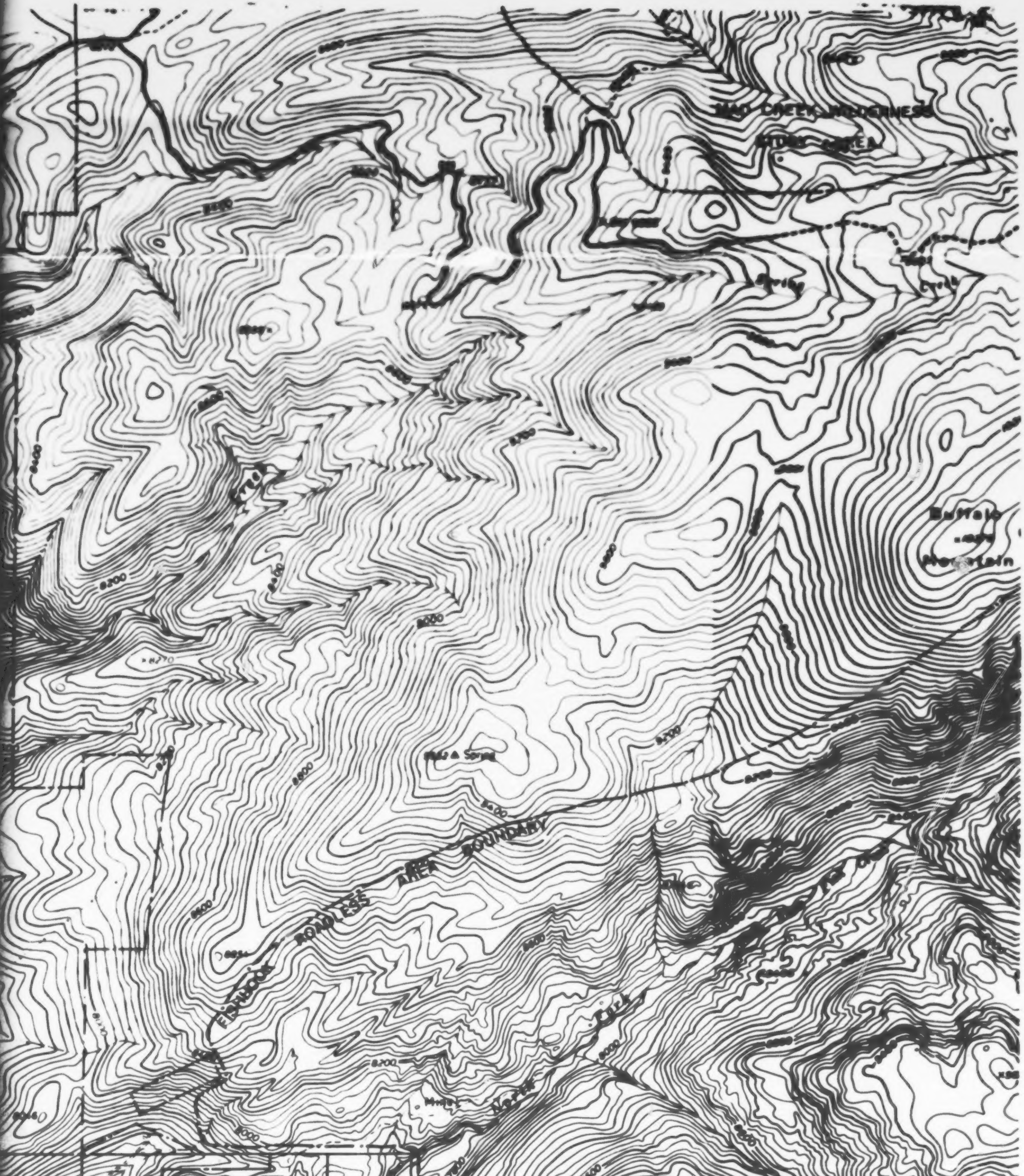
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STUDY AREA
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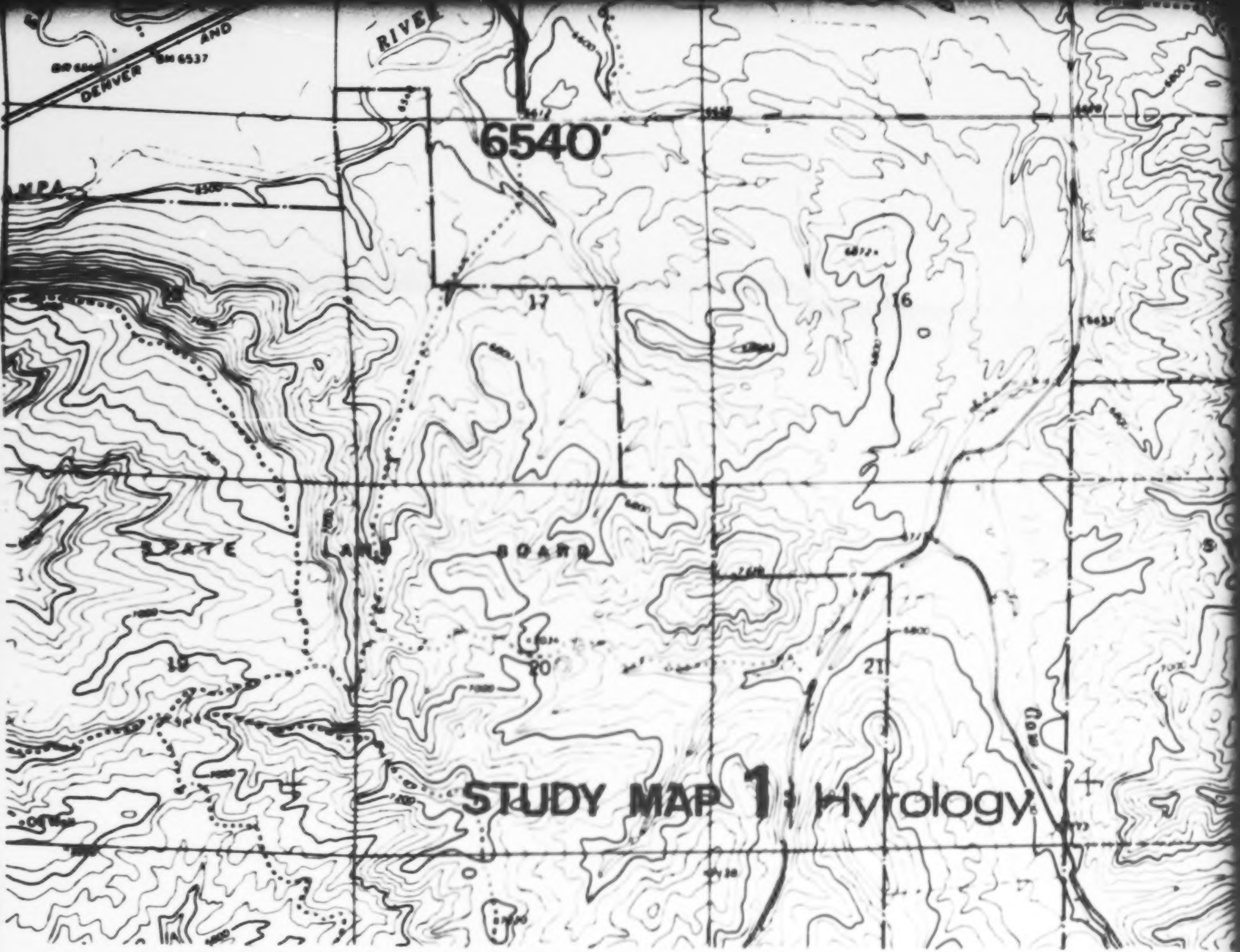
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STUDY MAP 1: Hyrology
DENVER AND
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steamboat springs region

wastewater treatment facilities environmental impact statement

scale 1" = 2000
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500
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4000
1 mile

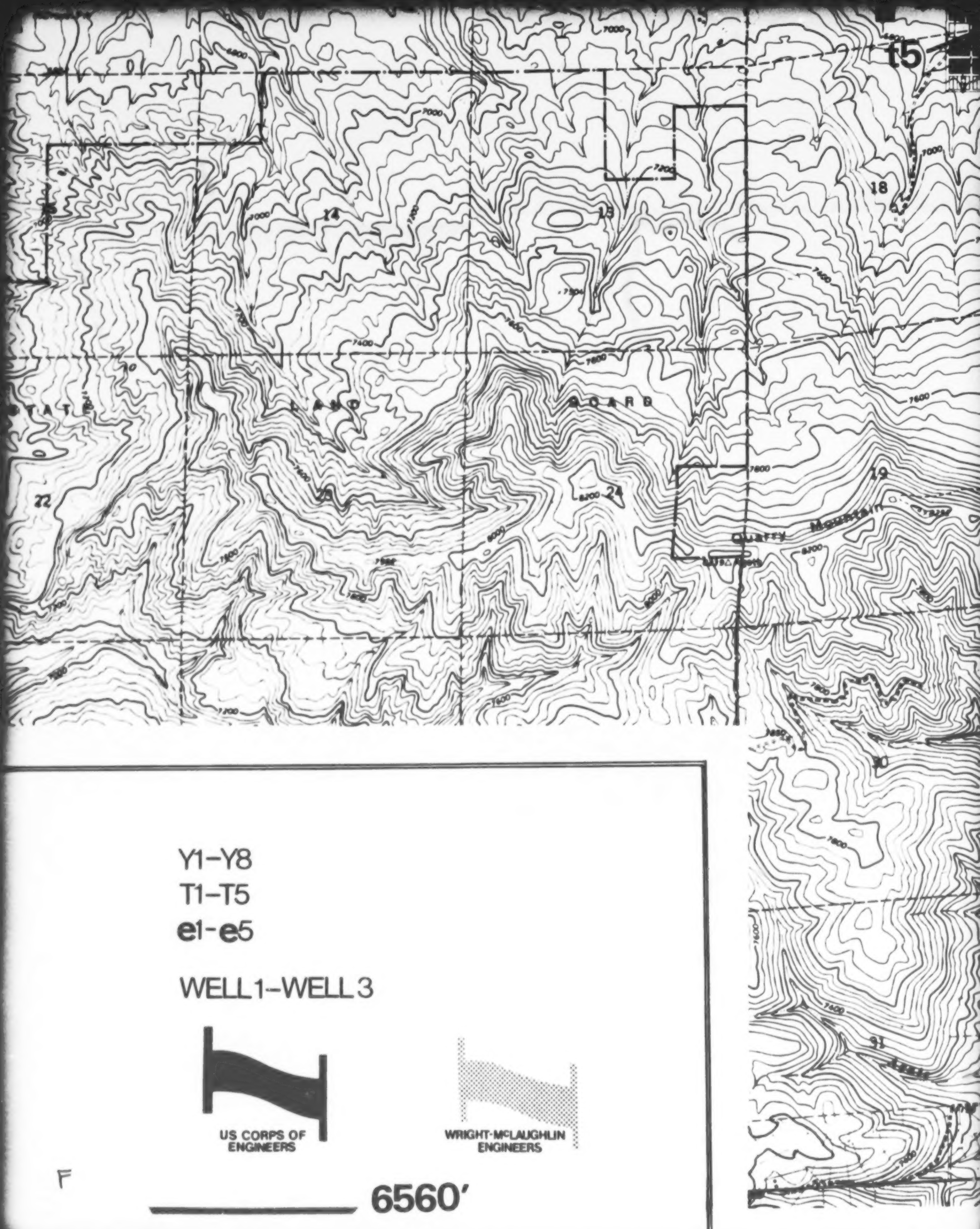
KEY:

SURFACE WATER SAMPLE SITES

GROUNDWATER SAMPLE SITES

100 YEAR FLOODPLAIN

WATER TABLE CONTOURS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WRIGHT-McLAUGHLIN ENGINEERS
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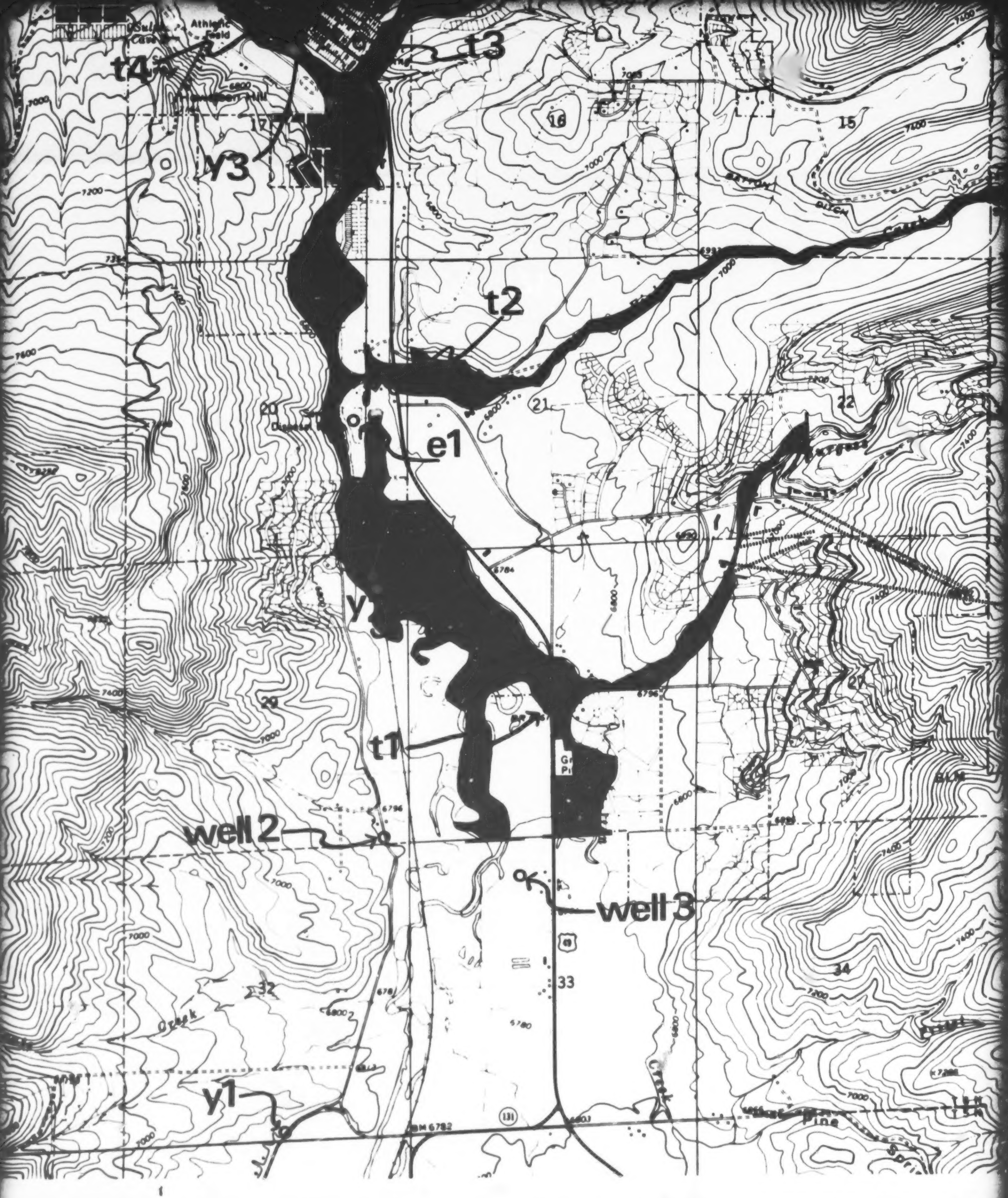
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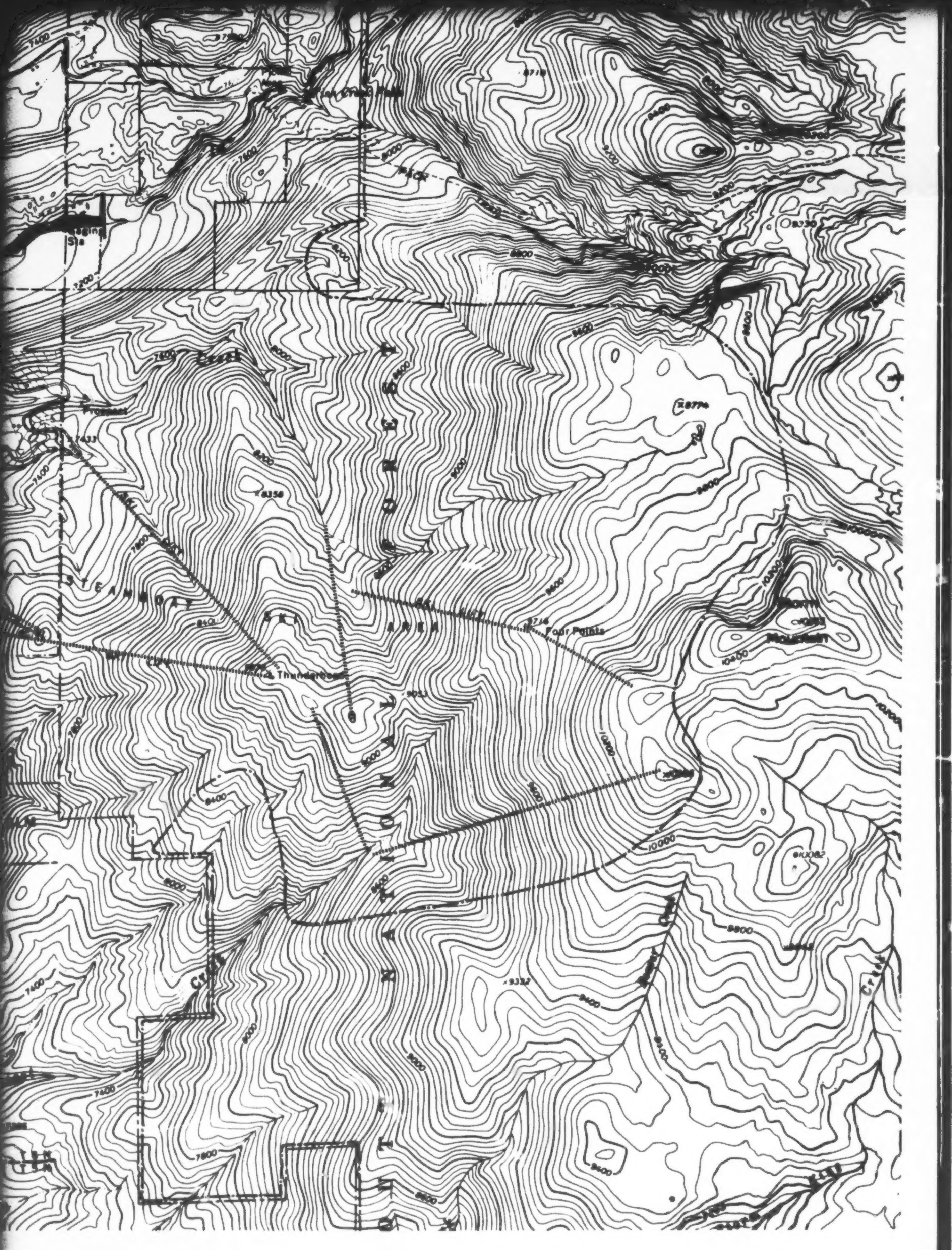

STEAMBOAT SKI AREA
Four Points
Thunderhead
Storm Mountain
Creek
Prospect
Loading Site
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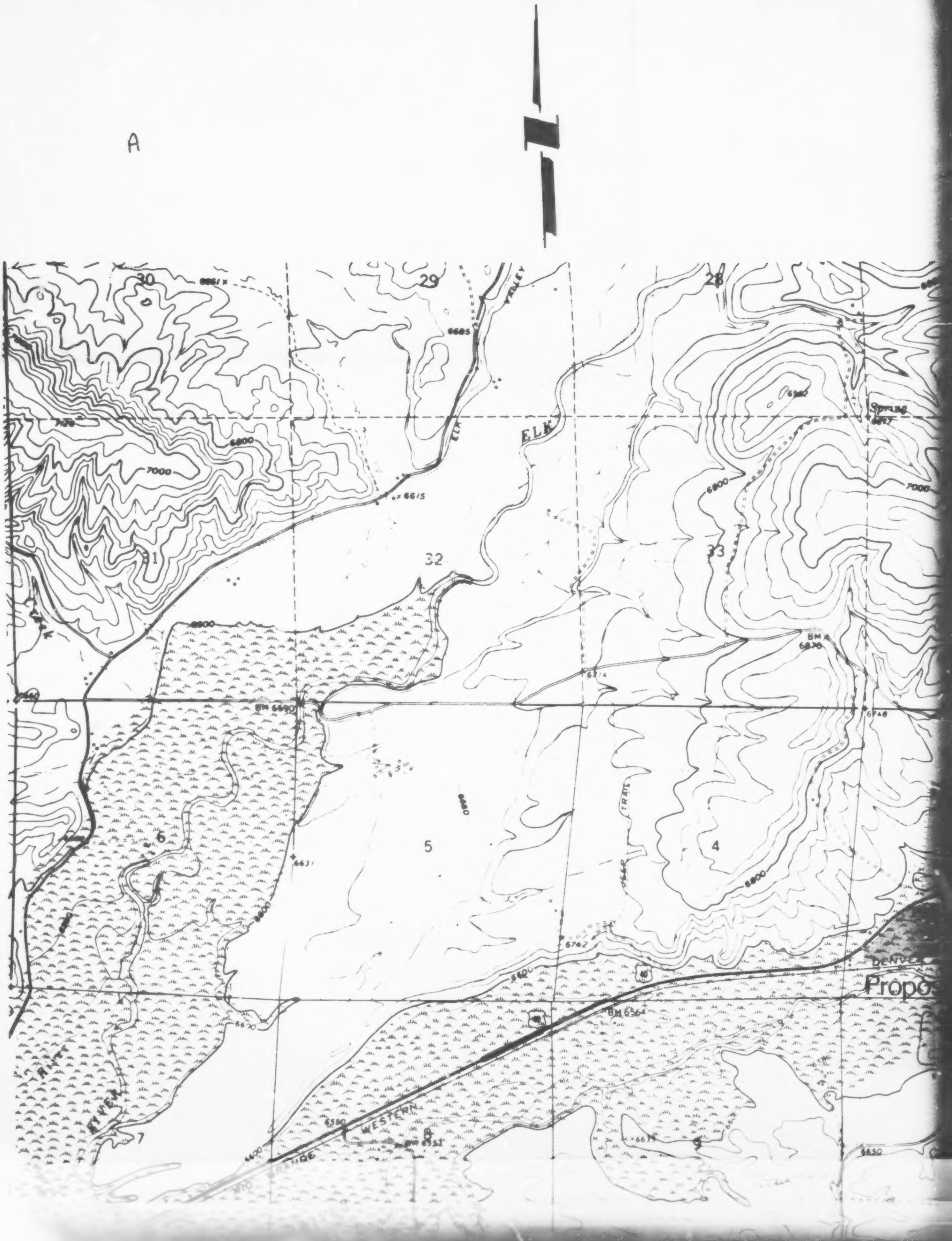
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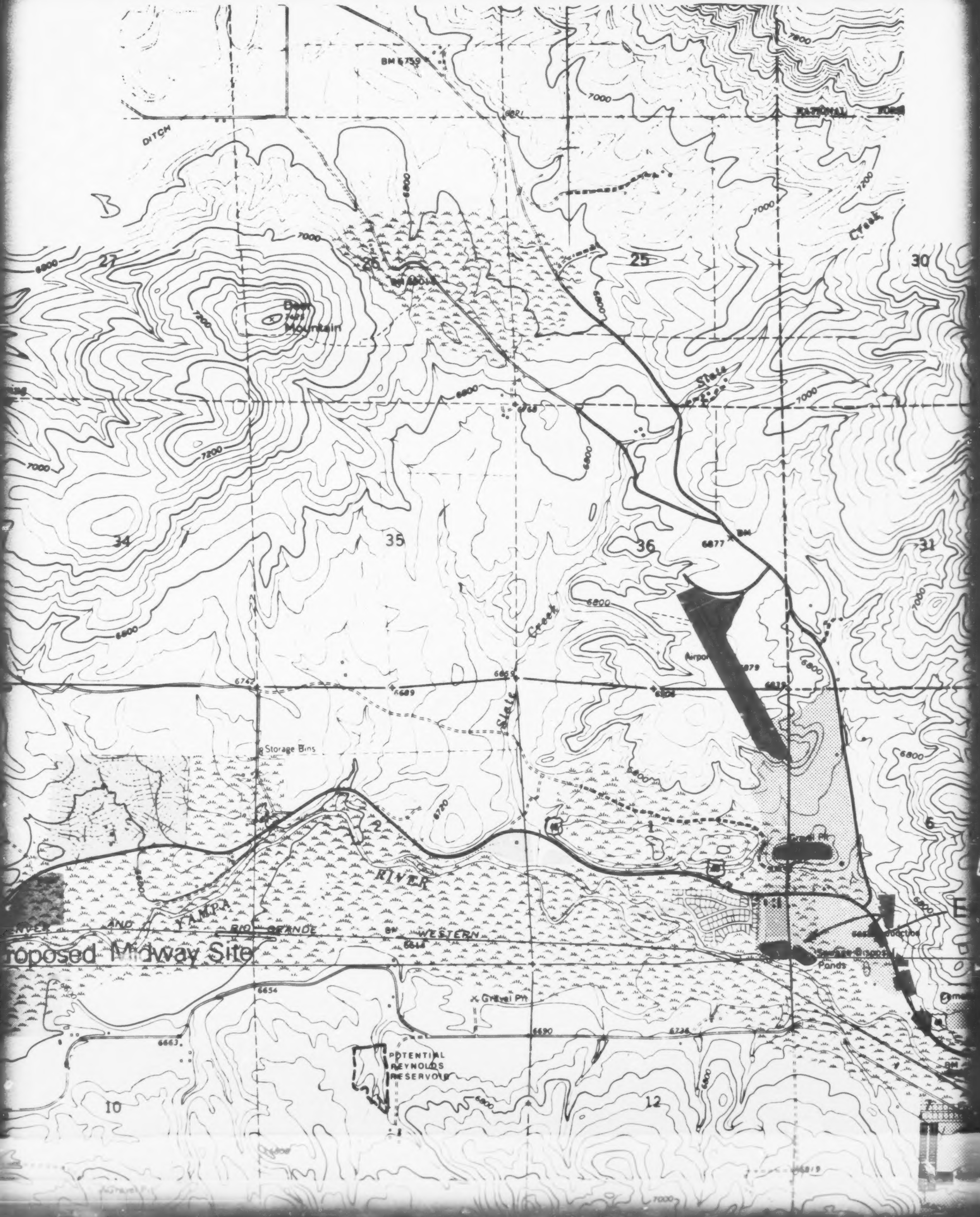
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Storage Bins
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Gravel Pit
RIVER
YAMPA
DENVER AND RIO GRANDE WESTERN
Proposed Midway Site
Sewage Disposal Ponds
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Gravel Pit
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POTENTIAL REYNOLDS RESERVOIR
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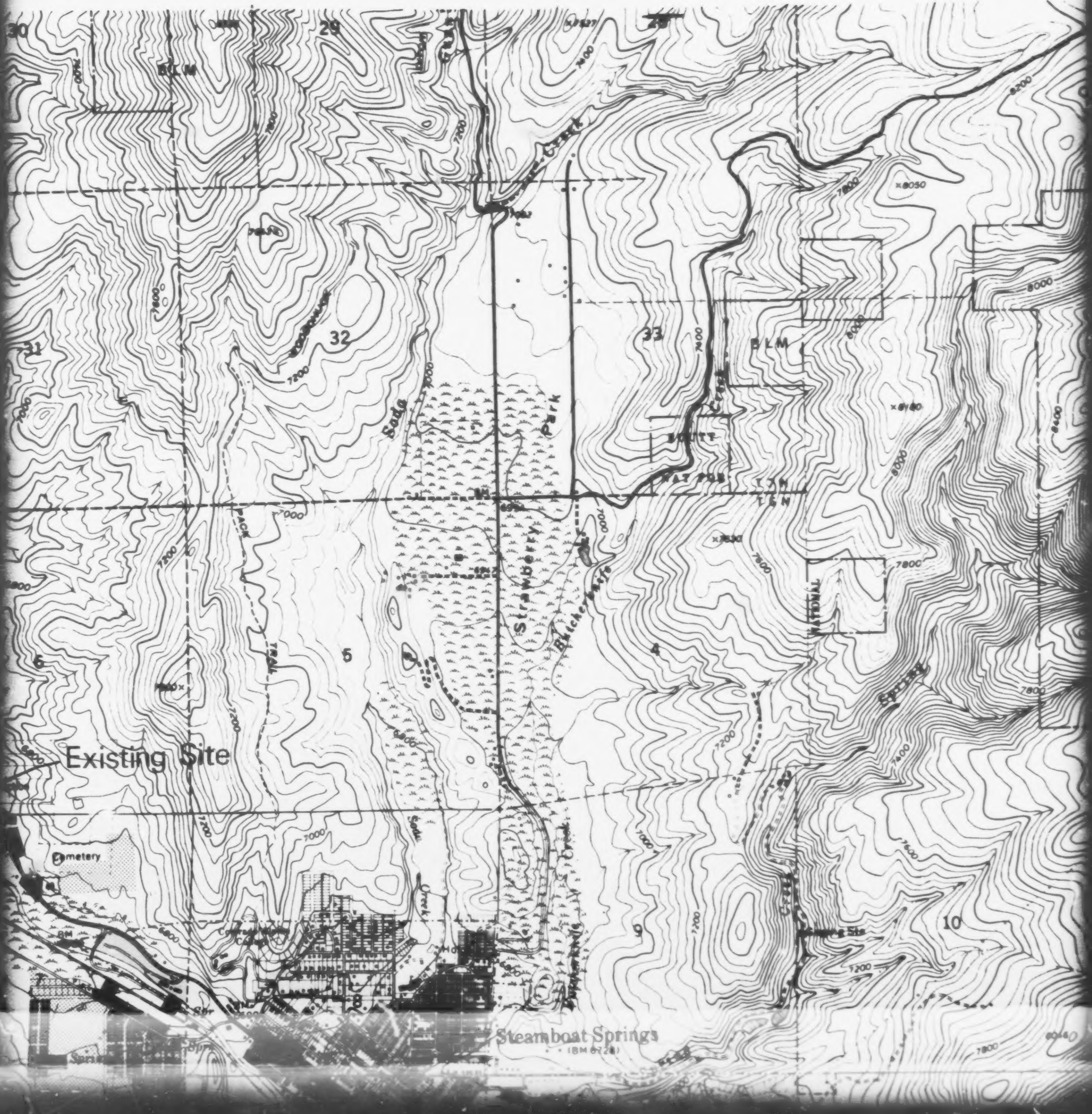
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NATIONAL
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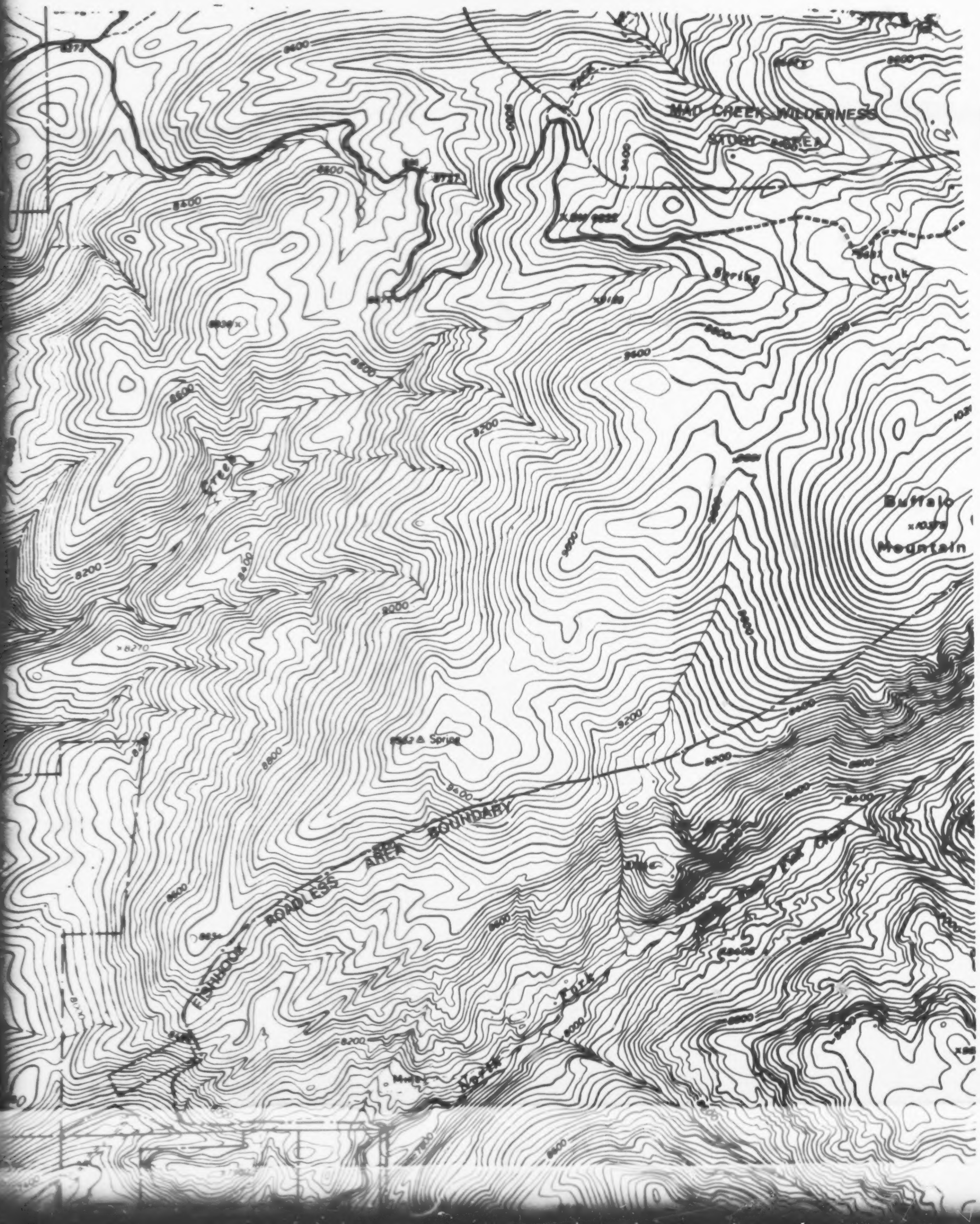
Existing Site
Cemetery
Steamboat Springs
(BM 6728)

D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STUDY AREA
Spring
Creek
Creek
Buffalo
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FISHHOOK ROADLESS AREA BOUNDARY
North Fork
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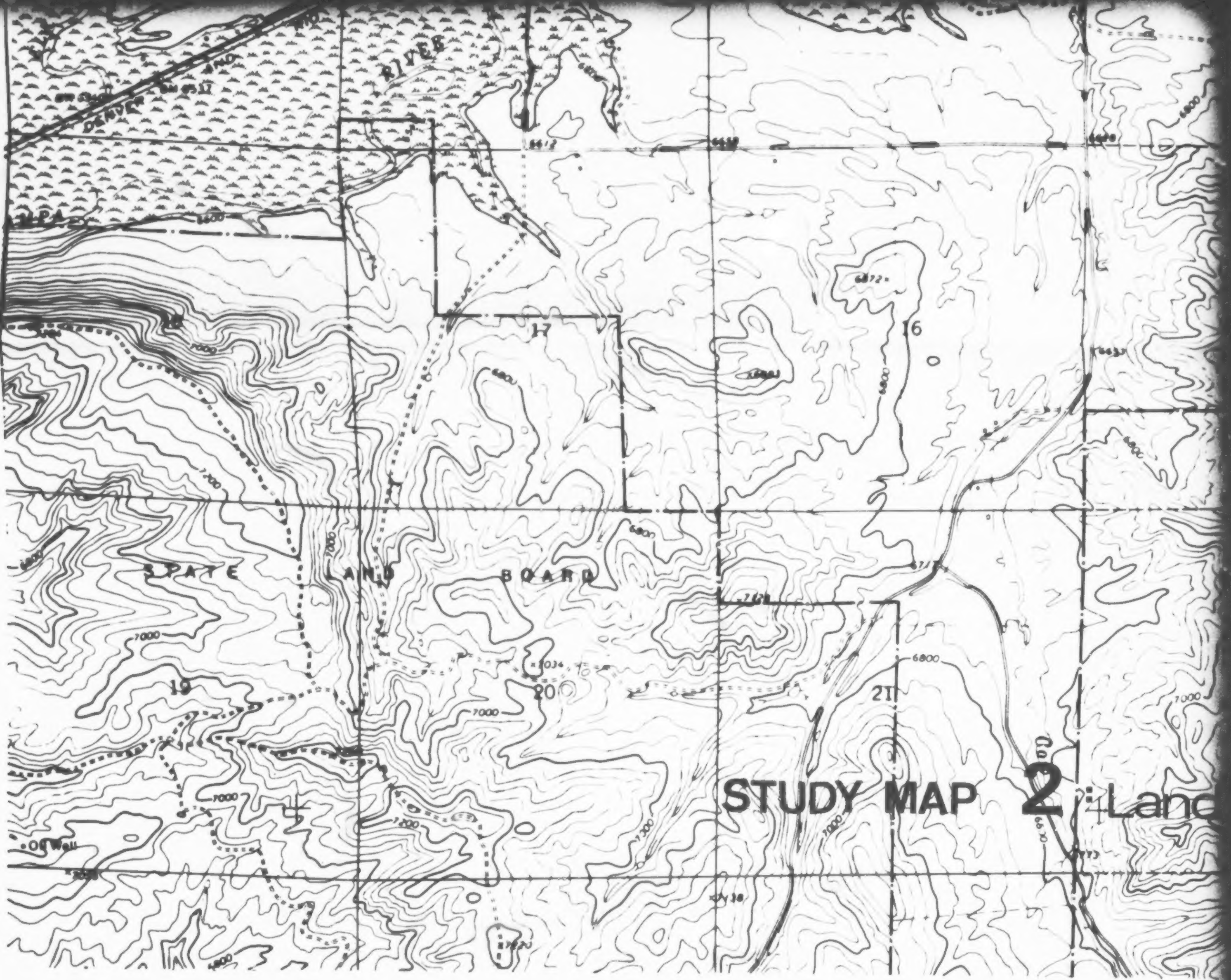
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17
16
19
20
21
6800
7000
7200
Oil Well
STUDY MAP 2 Land

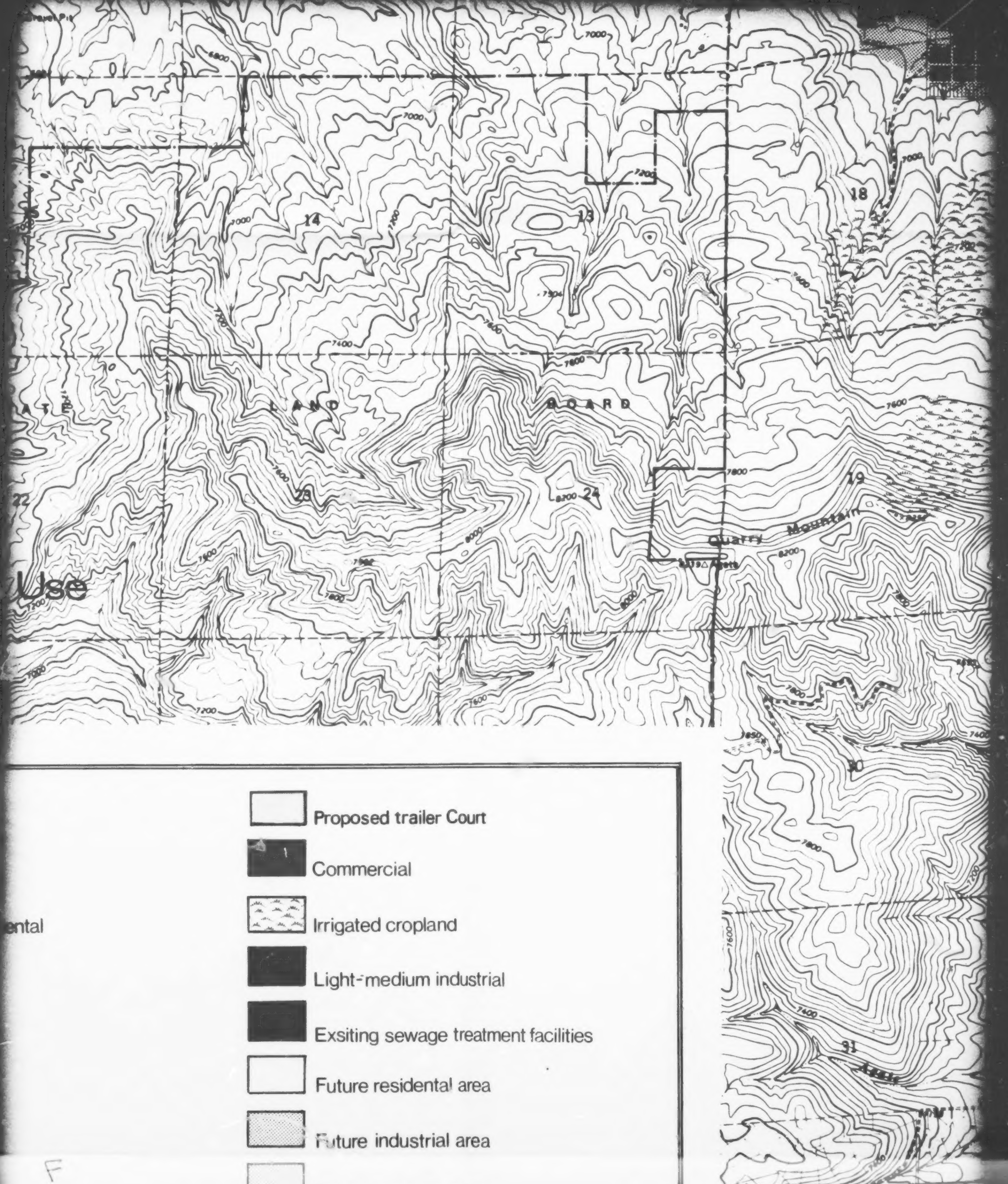
steamboat springs region

wastewater treatment facilities environmental impact statement

scale 1" = 2000'
0 500 1000 2000 4000 1 mile

Land Use Legend

- ▢ Low-medium density resid
- ▢ Trailer courts
- ▨ Golf courses
- ▢ Recreation areas
- ▨ Commercial/Residential
- ■ High density residential



Gravel Pit
ATE
LAND
BOARD
14
13
18
22
23
24
19
30
31
Quarry Mountain
7000
7200
7400
7600
7800
8000
8200

Use

ental

□ Proposed trailer Court

■ Commercial

▨ Irrigated cropland

■ Light-medium industrial

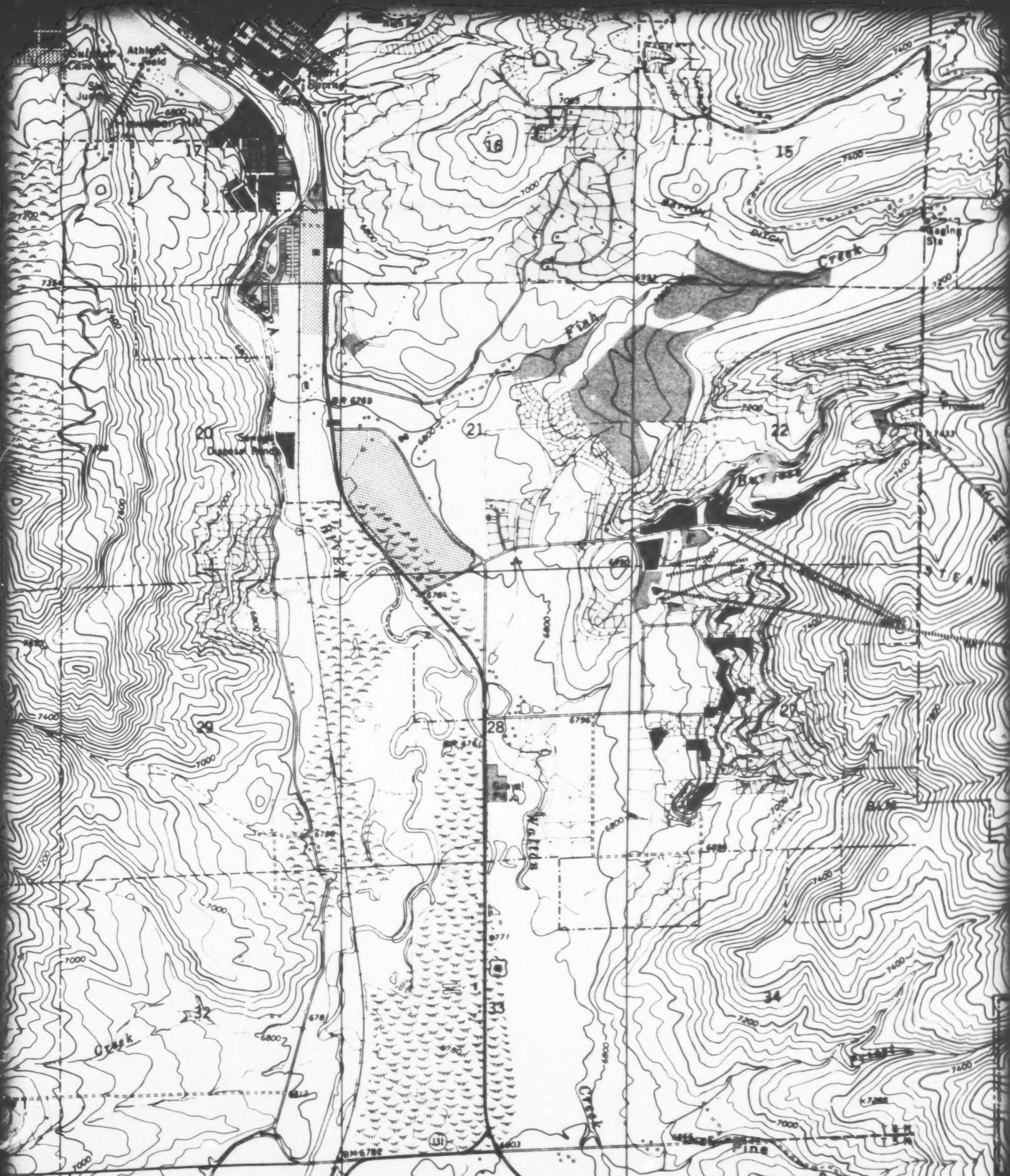
■ Exsiting sewage treatment facilities

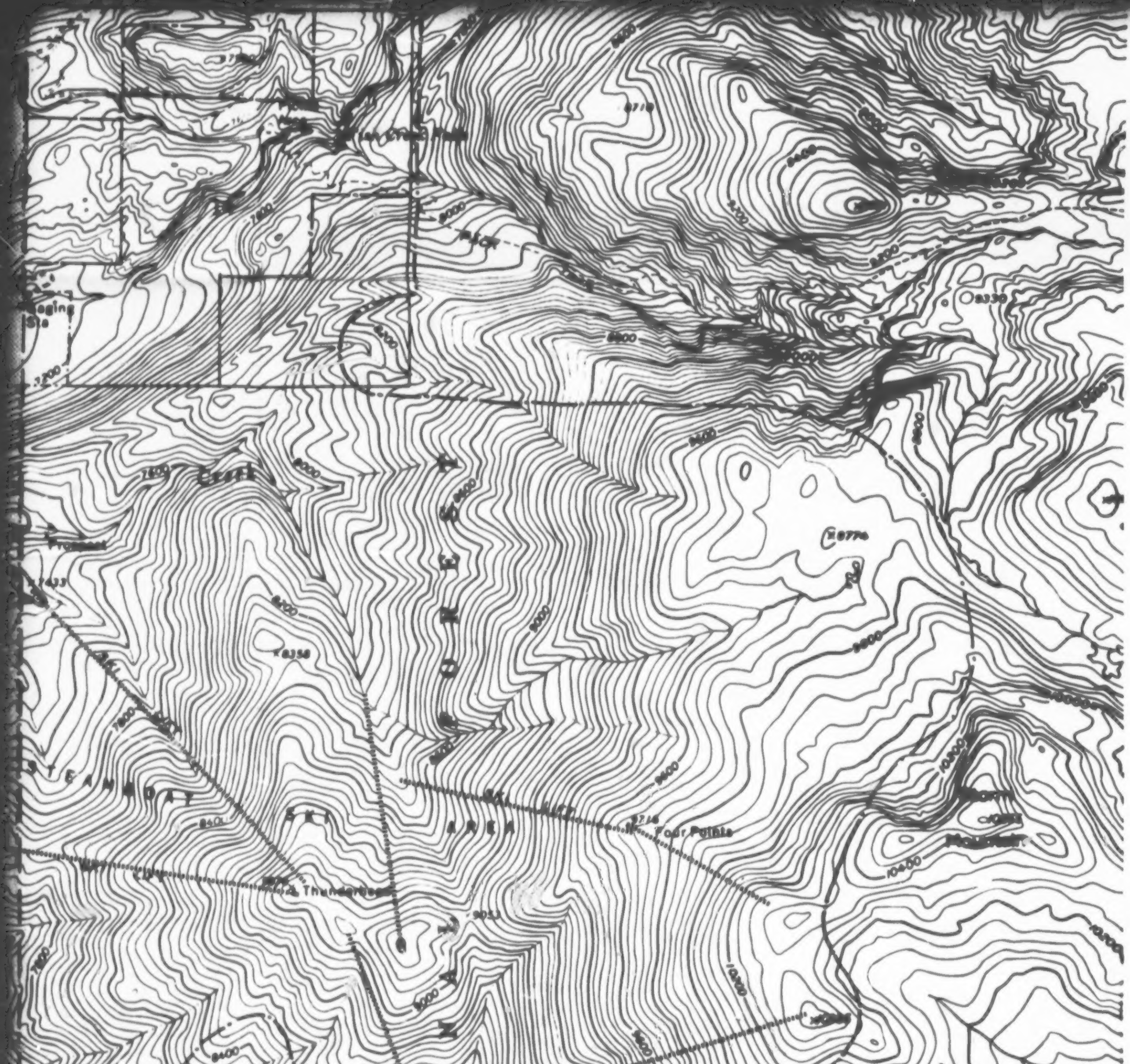
□ Future residental area

▨ Future industrial area

□ Future commercial area

F


Sulphur Cave
Athletic Field
Spring
16
15
17
20
21
22
27
28
29
32
33
34
Sewage Disposal Ponds
Ditch
Creek
Gaging Sta
Fish
Burgess
River
Gravel Pit
Walton
Creek
Creek
Pine
Spring
BM
131
T 6 N
T 5 N
6800
7000
7200
7400
7600


Logging Site
Creek
Prospect
STEAMBOAT
SKI
AREA
ROUTT
NATIONAL
FOREST
Ski Lift
Thunderhead
Four Points
Mountain
Creek
9716
9053
9332
8356
9776
10082
10000
10400
9600
9200
8800
8400
8000
7600
7200
7800

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